



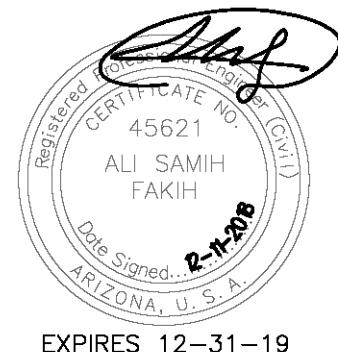
Drainage Reports

**PRELIMINARY DRAINAGE REPORT
HHL Property – 40 acres
128th Street and Ranch Gate Road
Scottsdale, AZ**

Prepared For:

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Project Number: 180424

**Original Submittal Date: AUG 15, 2018
Resubmittal Date: DEC 13, 2018**

Case No.: 18-ZN-2018

Plan Check No.: TBD

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1. INTRODUCTION

128th Street and Ranch Gate Road is a 40-acre proposed custom-lot residential subdivision located in the northeastern portion of Scottsdale, Arizona. This parcel is currently undeveloped and covered by typical Sonoran Desert type vegetation. The City of Scottsdale identifies the area of the site as 'Upper Desert' R1 – 130 within Environmentally Sensitive Lands (ESL) as shown on *FIGURE 2 – ESL Classification Map*. The purpose of this report is to support the rezoning application to R1-43 for approximately 33 lots in accordance with the City of Scottsdale zoning ordinance and the environmentally sensitive lands ordinance.

2. LOCATION AND PROJECT DESCRIPTION

2.1 LOCATION:

The project property, herein known as the Site, consists of one (1) parcel of land located on the SWC 128th Street and Ranch Gate Road. It is further defined as being in the Section 11, Township 4 North, Range 5 East of the Gila and Salt River Base and Meridian, Maricopa County, Scottsdale, Arizona; Parcel ID number is APN: 217-01-025A. Refer to *FIGURE 1 – Vicinity Map* for the Site location with respect to major cross streets.

2.2 EXISTING AND PROPOSED DEVELOPMENTS SURROUNDING THE SITE:

The Site is bounded by:

- Developed area known as Sereno Canyon to the west
- 128th Street alignment to the east
- Ranch Gate Road alignment to the north
- Juan Tabo Road alignment to the south

2.3 EXISTING SITE DESCRIPTION:

Land ownership includes 39.26 +/- gross acres (35.47 net acres) of undeveloped land. Existing zoning is designated as Single-family Residential, Environmentally Sensitive Lands (R1-130 ESL) per City of Scottsdale Zoning Map 34. Refer to *FIGURE 3 – Aerial Map* of the Site.

The project site lies in the northern corner of the City of Scottsdale with slopes approximately 3.12% from 2,704 feet in the southwest corner to 2,640 feet in the northeast corner. The existing topography of the Site indicates that runoff drains from the southwest to the northeast.

Vegetation cover on the Site is typical Sonoran Desert.

No washes on the Site are identified as a 'Vista Corridor' since calculated 100-year, 6-hour flows of washes are less than 750 cfs. Refer to *FIGURE 4 – Offsite Drainage Map and APPENDIX II Existing Drainage Area Map*.

2.4 PROPOSED SITE DEVELOPMENT:

Latest conceptual site plan includes a total of 33 residential lots. Main entry of the property is provided off Ranch Gate Road.

2.5 FLOOD HAZARD ZONE:

As defined by the Flood Insurance Rate Map (FIRM) for Maricopa County, Arizona, and Incorporated Areas, Panel number 1335 of 4350, as shown on Map Number 04013C1335M dated November 4th, 2015, the Site is designated as **Zone 'D'**. The definition of **Zone 'D'** by the FEMA indicates that the area lies in a zone of possible but undetermined flood hazards, as no analysis of flood hazards has been conducted. Refer to *FIGURE 5-FIRM*.

3. EXISTING DRAINAGE CONDITIONS

3.1 OFF-SITE DRAINAGE:

Off-site drainage that would impact the Site is within the development known as Sereno Canyon. It affects the Site to southwest corner. These off-site areas which impact the on-site drainage are currently undeveloped. Refer to Appendix IV for excerpts of approved Wood, Patel report for flows.

3.2 ON-SITE DRAINAGE:

Existing condition of the Site is undeveloped desert landscape sloping from southwest to northeast. The historical outlets are mainly placed along the northern and eastern boundary of property lines. Existing onsite drainage sub basin boundaries were identified using 2-foot contour mapping provided by the City of Scottsdale. Refer to previous drainage report (*Preliminary Drainage Report For 128th Street and Ranch Gate Road, Wood, Patel & Associates, Inc.*), and APPENDIX II – Existing Drainage Area Map. Onsite runoff is conveyed across the site via overland flow. Washes 1, 2, 3, and 4 are washes with flow greater than 50 cfs in a 100-year, 6-hour peak flow condition. These washes traverse the Site to the northeast corner and exit the Site at the property boundary. Excluding washes conveying flows over 50 cfs, onsite minor washes with flow less than 50 cfs in a 100-year, 6-hour storm event traverse northeasterly until they exit outside of the property. Delineation of the 100-year, 6-hour water surface extents for washes with flow rate 50 cfs or more has been presented based on HEC-RAS modeling and Water surface elevations for each wash as shown in APPENDIX II.

3.3 EXISTING RUNOFF RATES:

Referring to the previous drainage report, there are total of nine (9) historical outflow points along 128th Street and Ranch Gate Road that will have developed discharge rates maintained at or below existing conditions. Summary of existing discharge points flow rate are following:

- CP 1-OUT: 176 CFS
- CP 2-OUT: 3 CFS
- CP 3-OUT: 6 CFS
- CP 4-OUT: 413 CFS
- CP 5-OUT: 71 CFS
- CP 6-OUT: 2 CFS
- CP 7-OUT: 4 CFS
- CP 8-OUT: 182 CFS
- CP 9-OUT: 2 CFS

4. PROPOSED STORM WATER MANAGEMENT

4.1 DESIGN INTENT:

In accordance with City of Scottsdale, *Design Standards and Policies Manual*, on-site retention shall be provided to store runoff from rainfall events up to and including the 100-year, 2-hour duration event for sites that have not been previously developed.

The main purpose of the proposed drainage design is to provide pre-development vs. post-development flow attenuation along the major washes for the 100-year peak flows.

For all existing control points (CP 1-OUT through CP 9-OUT) established at 128th Street and Ranch Gate Road concentrated flow areas, the proposed runoff rates will be limited to a maximum of the existing runoff rates and stormwater storage upstream of the control points will be based on the proposed conditions area conveyed to each point. Small areas currently conveyed off-site to the north and south will be directed on site to contribute to associated control points.

4.2 DESIGN STORM REQUIREMENTS:

The on-site hydrology will be completed during the final design using the rational method in accordance with the City Manual and the FCDMC Manual during final engineering. The site is in an ESL zone and is currently undeveloped and will require storage for the 100-yr 2-hr storm event based on the proposed conditions C_{wt} vs existing conditions C_{wt} of the disturbed areas. The ultimate goal of the design is to control proposed off-site discharge to not greater than the existing flows.

4.3 CHARACTERISTICS OF DRAINAGE AREA:

Based on DS&PM, runoff coefficients for the 100-year storm event used are as follows:

- $C=0.45$ for undisturbed natural desert or desert landscape
- $C=0.61$ for the lots in R1- 43 zones
- $C=0.95$ for R.O.W areas.

HYDROLOGIC ANALYSIS: The hydrologic analysis is determined using the procedures in the City of Scottsdale Design Standards & Policies Manual and the Drainage Design Manual for Maricopa County, Arizona, Volume I. The Rational Method was utilized to compute the on-site peak discharges. The following established the Rational Method equation and the basic input data required:

$$Q=C_{wt}IA$$

Where:

C_{wt} = The runoff coefficient relating runoff to rainfall

I = Average rainfall intensity in inches/hour, lasting for T_c

T_c = The time of concentration (minutes)

A = The contributing drainage area in acres

The Site has been proposed to be a 33-lot residential area. Based on the preliminary grading plan, 17 drainage areas are developed to separate the storm runoff. The runoff coefficients for drainage areas and the rainfall data can be found to *APPENDIX II*.

The following table indicates the proposed drainage areas that contribute runoff to the outlets:

Outlet	Drainage Area ID
CP 1-OUT	DA1; Inlet 1-1, Inlet 1-2
CP 4-OUT	DA5, DA5A; Inlet 2-1, Inlet 2-2, Inlet 2-3
CP 5-OUT	DA10, DA11A, Inlet 2-4; Inlet 3-1, Inlet 3-2
CP 8-OUT	DA14; Inlet 4-1

Based on the table provided above, the historical outlets' flow rate in proposed condition are summarized below:

Historical Outlet	Proposed Q100 (cfs)	Existing Q100 (cfs)
CP 1-OUT	174	176
CP 2-OUT	0	3
CP 3-OUT	0	6
CP 4-OUT	366	413
CP 5-OUT	57	71
CP 6-OUT	0	2
CP 7-OUT	0	4
CP 8-OUT	179	182
CP 9-OUT	0	2

Referring to *APPENDIX II-Proposed Drainage Area Map and Proposed and Existing Drainage Calculation*. Based on the above summary, the post development flows are less than the existing conditions.

4.4 STORMWATER RETENTION:

First Flush storage required is calculated in accordance with COS– DS&PM. Required Retention (Acre-Feet) = $(0.5''/12)*A*(C_{wt})$

100-Yr, 2-hour stormwater storage required is calculated by pond rounding method in accordance with the COS – DS&PM. Refer to Appendix II for calculations and results. Required Retention (Acre-Feet) = $(P/12)*A*(C_{wt})$.

Where: P = 100 Yr. 2 Hr. Precipitation in Inches (Ref: Isopluvial from DS&PM, Appendix 4-1D, pg. 11 and NOAA Atlas 14 table)
 A = Area (Acres)
 C = C_{wt} (See Appendix II for calculation)

4.4.1 REQUIRED STORAGE:

Required storage for the 100-yr 2-hr storm will be calculated using three methods as follows:

- Calculate based on full 100-yr 2-hr storage (post vs existing of disturbed areas)
- Calculate based on pre- versus. Post- flow rate (using existing conditions as allowable outflow).
- Calculate First Flush

- Per DS&PM requirements, HEC-1 Modeling will be provided in subsequent submittals for the 2-yr, 10-yr, and 100-yr events.

Required First Flush:

Required storage is calculated in accordance with City of Scottsdale requirements as follows:

- First Flush = $0.5/12 * \text{Area} * 0.61$

The flowing table shows the required volume of first flush for each basin:

First Flush for each Basin		
Basin Number	Area (ac)	First flush volume (CF)
Basin 1	5.90	6532
Basin 2	4.52	5004
Basin 3	0.71	786
Basin 4	0.93	1030
Basin 5	0.33	365
	Total	13718

REQUIRED STORAGE BASED ON FULL RETENTION OF 100-yr 2-hr STORM EVENT:

In accordance with the COS-DS&PM, the 100-yr, 2-hour stormwater storage required (proposed vs. existing) is calculated by: $V_r = (P/12)*A*C_{wt}$.

Because the site is currently undeveloped, the required storage volume should be calculated under full 100-year, 2-hour storm event storage volume.

$$A = 14.88 \text{ ac} (\text{disturbed area}); C_{wt} = 0.61 \text{ (Based on R-43 Zoning)}$$

$$V_r = 2.71/12 * 14.88 \text{ AC} * 0.61 = \mathbf{2.05 \text{ ac. ft. (89,291.20 c.f.)}}$$

REQUIRED STORAGE BASED ON PRE VS. POST-DEVELOPMENT FLOW RATES:

Basin 2:

Allowable release rate at CP 4-OUT:

- | | |
|---|---------|
| • Off-site flow: | 349 cfs |
| • On-Site flow generated from drainage areas: | 17 cfs |
| Sub-Total flow to culvert: | 366 cfs |

$$\text{Allowable release from detention basin (Basin 2)} = 413 \text{ cfs existing} - 366 \text{ by-pass} = 47 \text{ cfs}$$

$$\text{Area to basin} = 8.33 \text{ ac}$$

Using the modified pond routing method (previously approved by the COS), the following summary indicates the calculated required storage volume where:

- 100-yr, 2-hr pond routing retention volume calculation is shown in Appendix II using the following equation:

$$V_r = (Q_{in} - Q_{out}) * T_c * 60$$

Where: V_r = Required storage volume

$$Q_{in} = C_{wt} * I * A_{(disturbed)}$$

$$Q_{out} = 0.45 * I_{(15 \text{ min})} * A_{(disturbed)}$$

$$T_c = \text{Time of Concentration}$$

Refer to Appendix II for the pond routing calculations.

4.4.2 PROPOSED STORAGE

Open retention basins will be used for this project. In accordance with COS design requirements, an open basin is limited to three (3) feet maximum depth with maximum side slopes of 4:1 (6:1 near streets) with one (1) foot freeboard and include an emergency overflow outlet.

- The volume for open basins is calculated using the area-sum volume method based on design contours.

A summary of preliminary available retention follows:

PROVIDED RETENTION VOLUME SUMMARY		REQUIRED RETENTION VOLUME SUMMARY	
BASIN ID	VOLUME PROVIDED (C.F.)	BASIN ID	VOLUME PROVIDED (C.F.)
1	42,721	1	42,167
2	38,647	2	36,708
3	4,164	3	3,607
4	6,790	4	4,819
5	4,963	5	1,618
TOTAL	97,284	TOTAL	88,919

The above summary indicated there is 97,284 c.f. of storage volume available. 97,284 c.f. available is larger than 88,919 c.f. required. In this design, required volumes for Basin 2 is calculated based on pond routing, Basin 1, 3, 4, and 5 are calculated based on full 100yr, 2hr storm events. Refer to Appendix II for individual basin volume calculations.

4.4.3 STORAGE DISCHARGE:

The discharge facilities of all basins will be designed in accordance with City of Scottsdale requirements using drywells or bleed-off pipes to provide total discharge within 36-hours. Geotechnical testing for percolation rates of the native soils will be completed to verify if adequate infiltration is available for proposed discharge assumptions. The number of proposed drywells will be adjusted (up or down) as required to meet design requirements.

4.5 PIPE CAPACITY CALCULATIONS:

These calculations will be provided in the Final Drainage Report.

4.6 STREET CAPACITY CALCULATIONS AND CURB OPENINGS:

These calculations will be provided in the Final Drainage Report.

4.7 STORM DRAIN INLET CALCULATIONS

These calculations will be provided in the Final Drainage Report.

5. FLOOD SAFETY FOR DWELLINGS

5.1 FINISHED FLOOR ELEVATIONS

All proposed building finished floor elevations will be set a minimum of 14 inches above emergency overflow points which will either be the low side top of curb elevation or natural points on the perimeter of the lots. Finished Floors will also be set a minimum of 12 inches above the 100-year high-water elevation of any adjacent streets and drainage paths. This will ensure that each building will be well above the 100-year water level.

6. CONCLUSIONS

6.1 OVERALL PROJECT:

1. FEMA Zone code "D" is assigned as shown on *FIGURE 5 – Flood Insurance Rate Map (FIRM)*.
2. Four major washes which convey flows over 50 cfs will be maintained in their original location and conditions.
3. Drainage corridors will be designated for the minor flows along the property in accordance with proper ordinance requirements from City of Scottsdale.
4. Storm water storage will be provided for 100-year, 2-hour storm water event and will discharge within 36 hours in accordance with City of Scottsdale requirements.
5. The finish floor elevations will be designed a minimum of 1 foot above the 100-year water surface in adjacent streets and drainage paths and a minimum of 14 inches above the low top of curb of the lot.
6. Maintenance is required for all drainage systems to assure design performance.

6.2 PROJECT PHASING:

As a residential development, the infrastructure may be constructed in a single phase to accommodate dwelling unit growth. The dwelling units will be phased based on consumer demand.

7. WARNING AND DISCLAIMER OF LIABILITY

RE: following page.

8. REFERENCES

1. *Design Standards & Policies Manual, City of Scottsdale – 2018*
2. *Drainage Design Manual for Maricopa County, Arizona, Volume I, Hydrology, Flood Control District of Maricopa County, Fourth Edition, August 15, 2013*
3. *Drainage Design Manual for Maricopa County, Arizona, Volume II, Hydraulics, Flood Control District of Maricopa County, August 15, 2013*
4. *Preliminary Drainage Report For 128th Street and Ranch Gate Road, Wood, Patel & Associates, Inc., January 9, 2009*

GRADING & DRAINAGE LANGUAGE

WARNING AND DISCLAIMER OF LIABILITY

The City's Stormwater and Floodplain Management Ordinance is intended to minimize the occurrence of losses, hazards and conditions adversely affecting the public health, safety and general welfare which might result from flooding.

The Stormwater and Floodplain Management Ordinance identifies floodplains, floodways, flood fringes and special flood hazard areas. However, a property outside these areas could be inundated by floods. Also, much of the city is a dynamic flood area; floodways, floodplains, flood fringes and special flood hazard areas may shift from one location to another, over time, due to natural processes.

WARNING AND DISCLAIMER OF LIABILITY

The flood protection provided by the Stormwater and Floodplain Management Ordinance is considered reasonable for regulatory purposes and is based on scientific and engineering considerations. Floods larger than the base flood can and will occur on rare occasions. Floodwater heights may be increased by constructed or natural causes. The Stormwater and Floodplain Management Ordinance does not create liability on the part of the city, any officer or employee thereof, or the federal, state or county government for any flood damages that result from reliance on the Ordinance or any administrative decision lawfully made thereunder.

Compliance with the Stormwater and Floodplain Management Ordinance does not ensure complete protection from flooding. Flood-related problems such as natural erosion, streambed meander, or constructed obstructions and diversions may occur and have an adverse effect in the event of a flood. You are advised to consult your own engineer or other expert regarding these considerations.

I have read and understand the above.

Plan Check #

Owner

Date

FIGURE 1



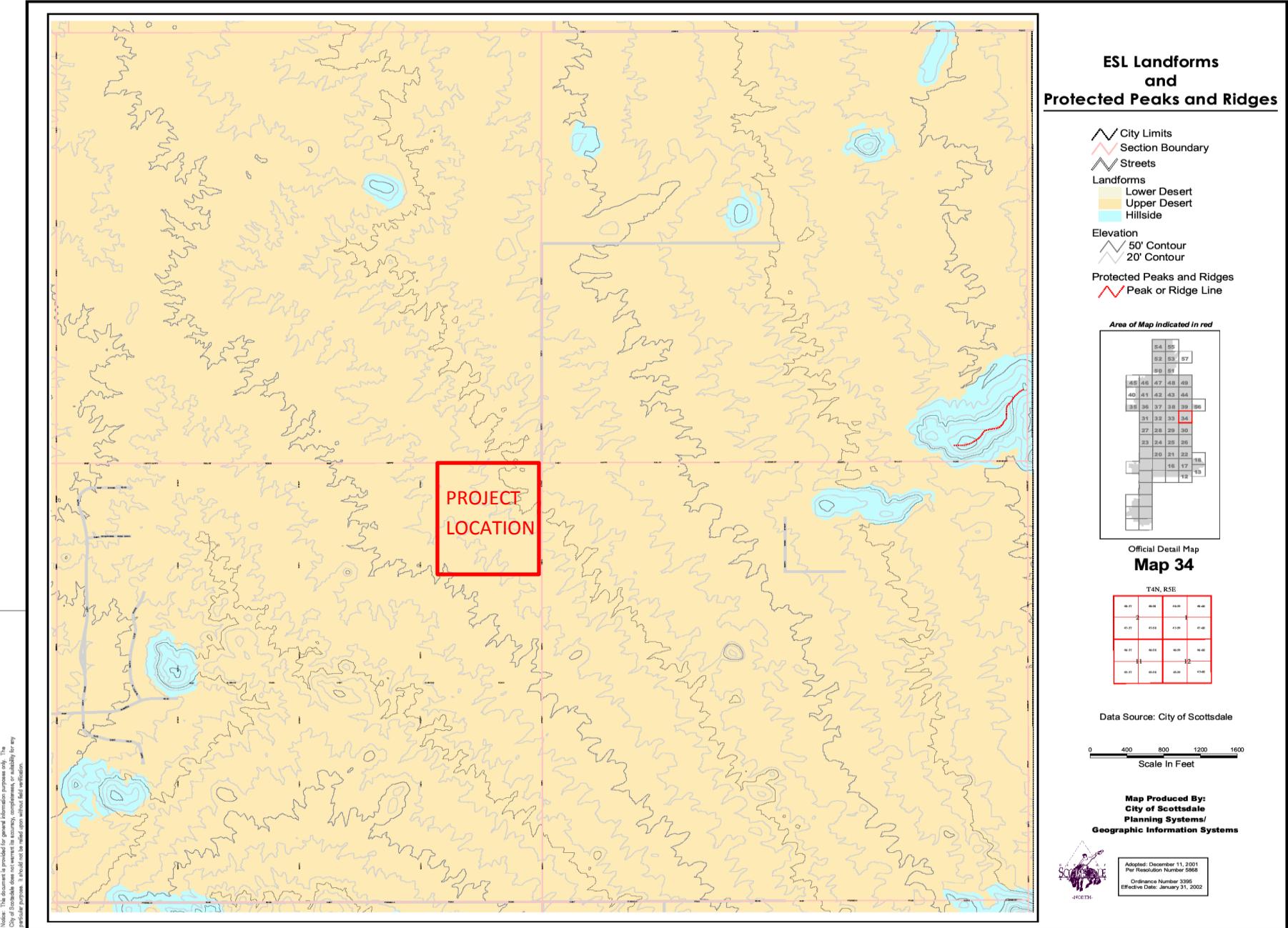


FIGURE 2 ESL MAP

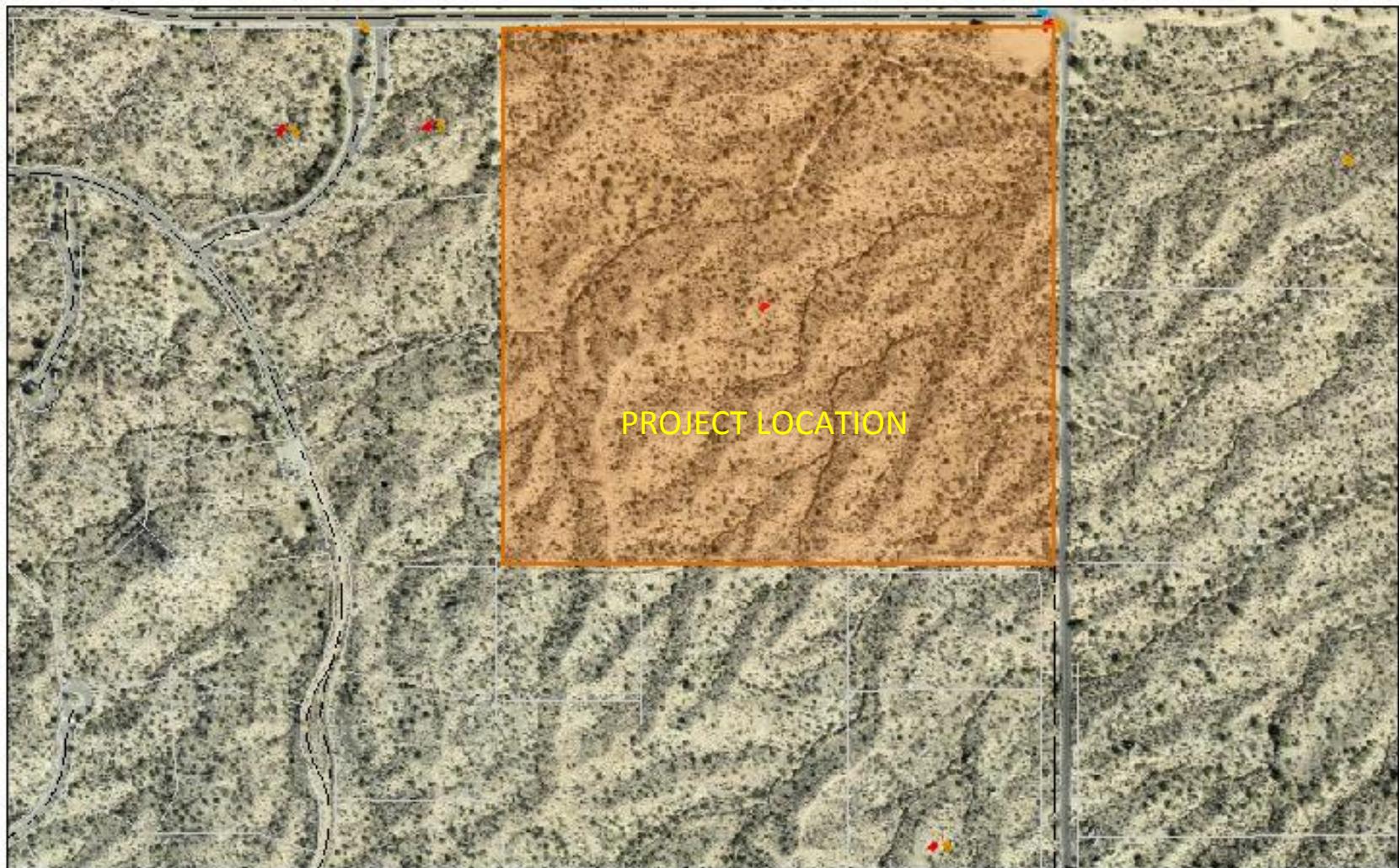
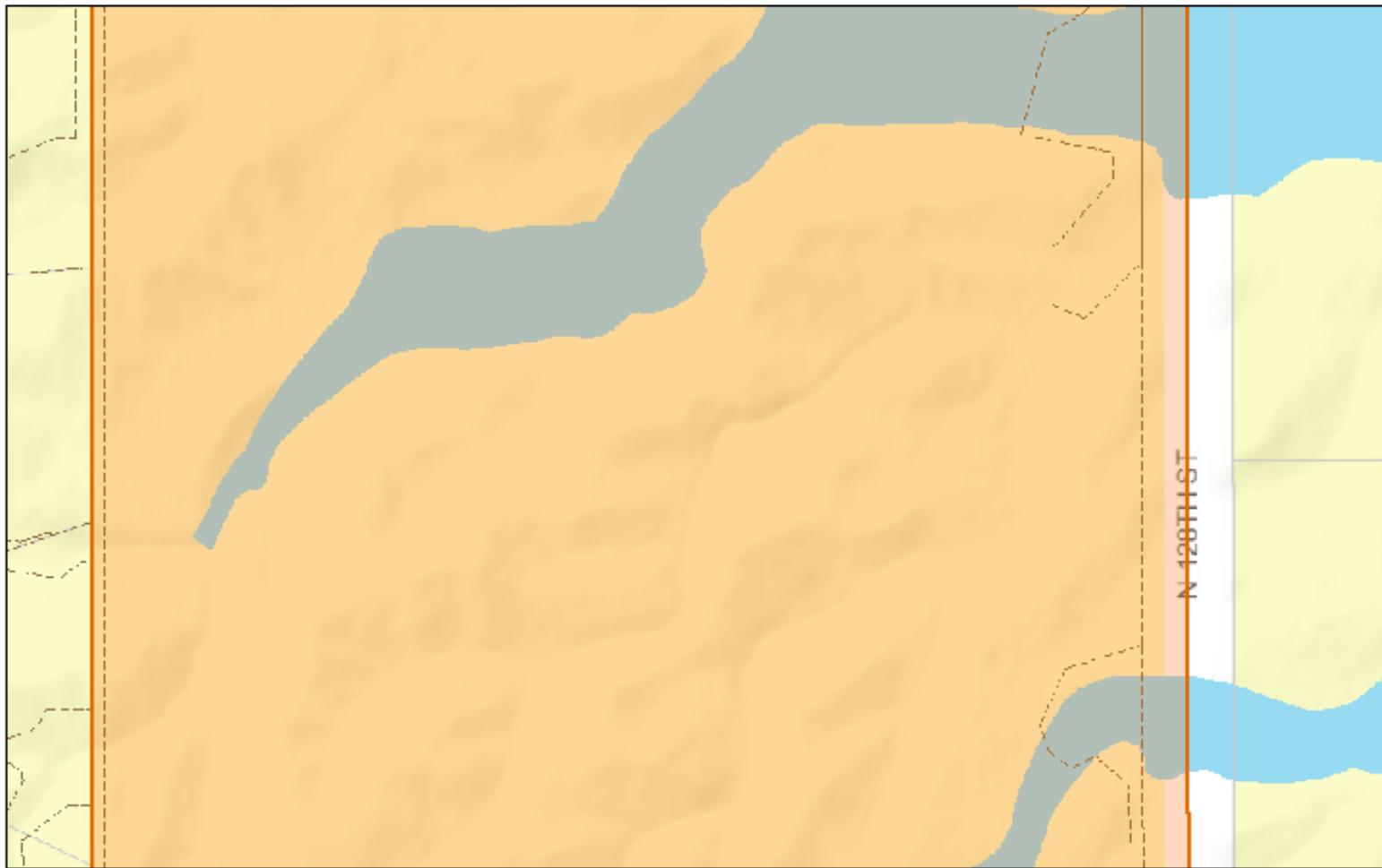


Figure 3
Aerial Map



August 14, 2018

Override 1 NAOS Leaders Street Centerlines GLO

Large Washes - 50cfs Zoning Easement

Easement Leaders

Parcel Boundary

NAOS

0 0.01 0.03 0.06 0.11 km
1:2,000
0 0.03 0.06

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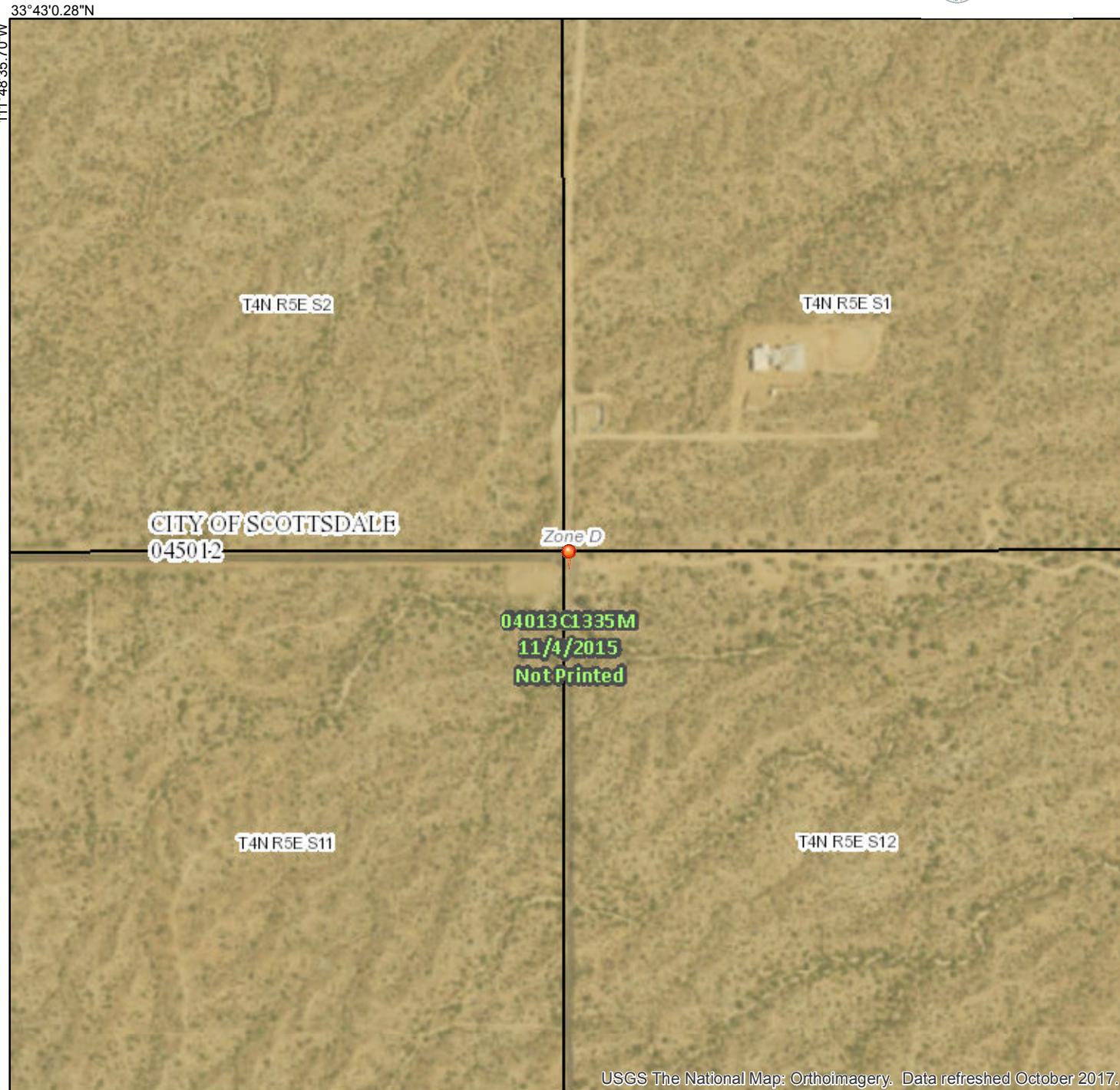
Figure 4

Offsite Drainage Map

National Flood Hazard Layer FIRMette



FEMA



Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS

- Without Base Flood Elevation (BFE)
Zone A, V, A99
- With BFE or Depth Zone AE, AO, AH, VE, AR
- Regulatory Floodway

- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee. See Notes. Zone X
- Area with Flood Risk due to Levee Zone D

OTHER AREAS OF FLOOD HAZARD

- NO SCREEN Area of Minimal Flood Hazard Zone X
- Effective LOMRs

OTHER AREAS

- Area of Undetermined Flood Hazard Zone D

GENERAL STRUCTURES

- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation

- Coastal Transect

- Base Flood Elevation Line (BFE)

- Limit of Study

- Jurisdiction Boundary

- Coastal Transect Baseline

- Profile Baseline

- Hydrographic Feature

- Digital Data Available
- No Digital Data Available

- Unmapped



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 11/13/2018 at 7:19:41 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Figure 5 FIRM

APPENDIX I

Rainfall Data

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Sustainability Engineering Group

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APPENDIX

**NOAA Atlas 14, Volume 1, Version 5****Location name: Scottsdale, Arizona, USA*****Latitude: 33.71°, Longitude: -111.8°****Elevation: 2616.82 ft****

* source: ESRI Maps

** source: USGS

**POINT PRECIPITATION FREQUENCY ESTIMATES**

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps & aerials](#)
PF tabular

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.241 (0.201-0.298)	0.315 (0.264-0.390)	0.425 (0.350-0.522)	0.506 (0.414-0.619)	0.612 (0.494-0.746)	0.691 (0.552-0.839)	0.771 (0.605-0.933)	0.849 (0.658-1.03)	0.953 (0.720-1.16)	1.03 (0.765-1.26)
10-min	0.367 (0.306-0.453)	0.480 (0.401-0.593)	0.646 (0.533-0.794)	0.770 (0.630-0.942)	0.932 (0.752-1.14)	1.05 (0.840-1.28)	1.17 (0.922-1.42)	1.29 (1.00-1.56)	1.45 (1.10-1.76)	1.57 (1.17-1.92)
15-min	0.455 (0.379-0.562)	0.595 (0.497-0.735)	0.801 (0.661-0.985)	0.954 (0.781-1.17)	1.16 (0.932-1.41)	1.30 (1.04-1.58)	1.45 (1.14-1.76)	1.60 (1.24-1.94)	1.80 (1.36-2.18)	1.95 (1.44-2.38)
30-min	0.613 (0.510-0.756)	0.802 (0.669-0.990)	1.08 (0.890-1.33)	1.29 (1.05-1.57)	1.56 (1.26-1.90)	1.76 (1.40-2.13)	1.96 (1.54-2.37)	2.16 (1.67-2.61)	2.42 (1.83-2.94)	2.63 (1.95-3.20)
60-min	0.759 (0.632-0.936)	0.992 (0.828-1.23)	1.34 (1.10-1.64)	1.59 (1.30-1.95)	1.93 (1.55-2.35)	2.17 (1.74-2.64)	2.42 (1.90-2.93)	2.67 (2.07-3.23)	3.00 (2.27-3.63)	3.25 (2.41-3.96)
2-hr	0.871 (0.731-1.05)	1.13 (0.948-1.36)	1.50 (1.25-1.80)	1.77 (1.47-2.14)	2.15 (1.76-2.57)	2.43 (1.96-2.90)	2.71 (2.16-3.24)	3.00 (2.35-3.57)	3.37 (2.59-4.01)	3.66 (2.75-4.39)
3-hr	0.933 (0.784-1.14)	1.20 (1.01-1.47)	1.56 (1.30-1.91)	1.84 (1.53-2.25)	2.24 (1.83-2.72)	2.55 (2.06-3.08)	2.87 (2.28-3.47)	3.20 (2.50-3.86)	3.65 (2.77-4.40)	4.02 (2.97-4.84)
6-hr	1.13 (0.971-1.34)	1.43 (1.23-1.69)	1.81 (1.55-2.14)	2.11 (1.79-2.49)	2.53 (2.12-2.97)	2.85 (2.35-3.34)	3.19 (2.59-3.73)	3.52 (2.82-4.13)	3.97 (3.09-4.64)	4.31 (3.29-5.04)
12-hr	1.36 (1.18-1.59)	1.71 (1.48-2.00)	2.15 (1.85-2.50)	2.50 (2.14-2.91)	2.97 (2.52-3.45)	3.33 (2.79-3.86)	3.71 (3.06-4.29)	4.08 (3.33-4.72)	4.57 (3.64-5.31)	4.94 (3.87-5.78)
24-hr	1.67 (1.47-1.91)	2.12 (1.88-2.43)	2.76 (2.43-3.16)	3.27 (2.87-3.75)	4.00 (3.47-4.59)	4.59 (3.94-5.26)	5.21 (4.42-6.01)	5.87 (4.90-6.80)	6.79 (5.56-7.95)	7.54 (6.06-8.91)
2-day	1.92 (1.69-2.21)	2.46 (2.16-2.82)	3.25 (2.84-3.72)	3.89 (3.39-4.45)	4.80 (4.14-5.50)	5.54 (4.72-6.36)	6.32 (5.33-7.30)	7.16 (5.96-8.32)	8.34 (6.80-9.79)	9.30 (7.46-11.0)
3-day	2.08 (1.83-2.38)	2.67 (2.35-3.05)	3.55 (3.11-4.06)	4.28 (3.73-4.88)	5.32 (4.60-6.08)	6.18 (5.28-7.07)	7.10 (6.00-8.17)	8.08 (6.74-9.38)	9.50 (7.75-11.1)	10.7 (8.55-12.6)
4-day	2.23 (1.97-2.55)	2.87 (2.53-3.28)	3.86 (3.39-4.39)	4.67 (4.08-5.31)	5.84 (5.06-6.65)	6.81 (5.84-7.79)	7.87 (6.67-9.04)	9.01 (7.51-10.4)	10.7 (8.70-12.5)	12.0 (9.65-14.2)
7-day	2.57 (2.25-2.95)	3.30 (2.89-3.79)	4.44 (3.88-5.10)	5.39 (4.68-6.19)	6.78 (5.82-7.78)	7.93 (6.75-9.14)	9.19 (7.72-10.6)	10.6 (8.74-12.4)	12.6 (10.2-14.8)	14.2 (11.3-17.0)
10-day	2.82 (2.48-3.22)	3.63 (3.20-4.14)	4.86 (4.26-5.54)	5.87 (5.12-6.70)	7.34 (6.34-8.38)	8.56 (7.32-9.80)	9.88 (8.35-11.4)	11.3 (9.42-13.1)	13.4 (10.9-15.7)	15.1 (12.1-17.9)
20-day	3.58 (3.16-4.08)	4.62 (4.08-5.25)	6.14 (5.40-6.98)	7.34 (6.42-8.34)	9.01 (7.82-10.2)	10.3 (8.88-11.8)	11.7 (9.99-13.5)	13.2 (11.1-15.2)	15.2 (12.6-17.8)	16.9 (13.8-19.9)
30-day	4.25 (3.75-4.83)	5.49 (4.85-6.23)	7.30 (6.43-8.26)	8.71 (7.64-9.85)	10.7 (9.28-12.1)	12.2 (10.5-13.8)	13.8 (11.8-15.7)	15.5 (13.1-17.7)	17.8 (14.8-20.6)	19.6 (16.1-22.9)
45-day	5.09 (4.49-5.78)	6.59 (5.81-7.47)	8.75 (7.70-9.92)	10.4 (9.13-11.8)	12.7 (11.1-14.4)	14.5 (12.5-16.5)	16.4 (14.0-18.8)	18.3 (15.5-21.2)	21.1 (17.5-24.6)	23.3 (19.1-27.4)
60-day	5.79 (5.12-6.56)	7.52 (6.64-8.50)	9.95 (8.77-11.3)	11.8 (10.3-13.4)	14.2 (12.4-16.2)	16.1 (14.0-18.4)	18.1 (15.5-20.7)	20.1 (17.1-23.2)	22.9 (19.2-26.7)	25.1 (20.7-29.5)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

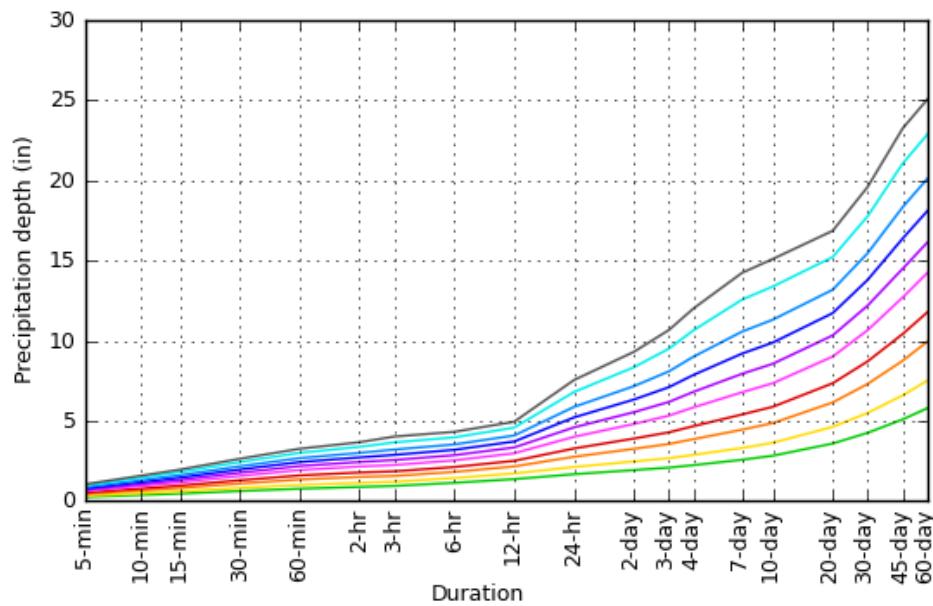
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

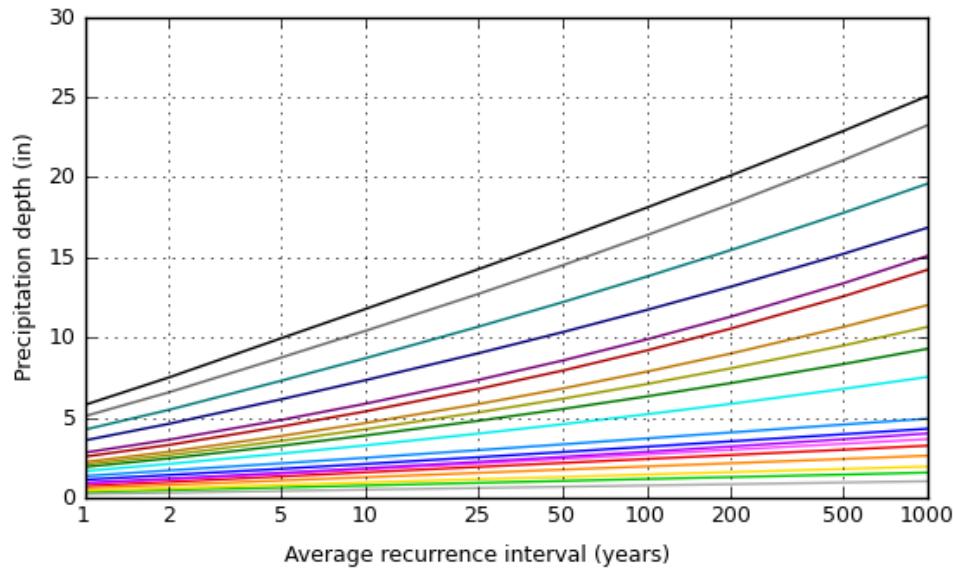
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PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 33.7100°, Longitude: -111.8000°



Average recurrence interval (years)
1
2
5
10
25
50
100
200
500
1000



Duration
5-min
10-min
15-min
30-min
60-min
2-hr
3-hr
6-hr
12-hr
24-hr
2-day
3-day
4-day
7-day
10-day
20-day
30-day
45-day
60-day

Maps & aerials**Small scale terrain**

**NOAA Atlas 14, Volume 1, Version 5****Location name: Scottsdale, Arizona, USA*****Latitude: 33.71°, Longitude: -111.8°****Elevation: 2616.82 ft****

* source: ESRI Maps

** source: USGS

**POINT PRECIPITATION FREQUENCY ESTIMATES**

Sanja Perica, Sarah Dietz, Sarah Heim, Lillian Hiner, Kazungu Maitaria, Deborah Martin, Sandra Pavlovic, Ishani Roy, Carl Trypaluk, Dale Unruh, Fenglin Yan, Michael Yekta, Tan Zhao, Geoffrey Bonnin, Daniel Brewer, Li-Chuan Chen, Tye Parzybok, John Yarchoan

NOAA, National Weather Service, Silver Spring, Maryland

[PF_tabular](#) | [PF_graphical](#) | [Maps & aerials](#)
PF tabular

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	2.89 (2.41-3.58)	3.78 (3.17-4.68)	5.10 (4.20-6.26)	6.07 (4.97-7.43)	7.34 (5.93-8.95)	8.29 (6.62-10.1)	9.25 (7.26-11.2)	10.2 (7.90-12.3)	11.4 (8.64-13.9)	12.4 (9.18-15.1)
10-min	2.20 (1.84-2.72)	2.88 (2.41-3.56)	3.88 (3.20-4.76)	4.62 (3.78-5.65)	5.59 (4.51-6.82)	6.31 (5.04-7.66)	7.04 (5.53-8.52)	7.76 (6.01-9.38)	8.70 (6.58-10.5)	9.44 (6.99-11.5)
15-min	1.82 (1.52-2.25)	2.38 (1.99-2.94)	3.20 (2.64-3.94)	3.82 (3.12-4.67)	4.62 (3.73-5.64)	5.22 (4.17-6.33)	5.82 (4.57-7.04)	6.41 (4.96-7.75)	7.19 (5.44-8.72)	7.80 (5.78-9.50)
30-min	1.23 (1.02-1.51)	1.60 (1.34-1.98)	2.16 (1.78-2.65)	2.57 (2.10-3.15)	3.11 (2.51-3.79)	3.51 (2.81-4.26)	3.92 (3.08-4.74)	4.32 (3.34-5.22)	4.84 (3.66-5.87)	5.26 (3.89-6.40)
60-min	0.759 (0.632-0.936)	0.992 (0.828-1.23)	1.34 (1.10-1.64)	1.59 (1.30-1.95)	1.93 (1.55-2.35)	2.17 (1.74-2.64)	2.42 (1.90-2.93)	2.67 (2.07-3.23)	3.00 (2.27-3.63)	3.25 (2.41-3.96)
2-hr	0.436 (0.366-0.525)	0.564 (0.474-0.682)	0.748 (0.624-0.901)	0.886 (0.733-1.07)	1.07 (0.878-1.29)	1.21 (0.981-1.45)	1.36 (1.08-1.62)	1.50 (1.17-1.78)	1.69 (1.29-2.01)	1.83 (1.38-2.19)
3-hr	0.311 (0.261-0.381)	0.398 (0.335-0.490)	0.518 (0.434-0.636)	0.614 (0.509-0.750)	0.746 (0.608-0.905)	0.850 (0.684-1.03)	0.956 (0.758-1.16)	1.07 (0.832-1.29)	1.22 (0.922-1.47)	1.34 (0.990-1.61)
6-hr	0.189 (0.162-0.224)	0.238 (0.205-0.283)	0.302 (0.258-0.358)	0.353 (0.299-0.416)	0.422 (0.353-0.496)	0.476 (0.393-0.558)	0.532 (0.433-0.623)	0.589 (0.470-0.689)	0.662 (0.516-0.774)	0.720 (0.549-0.842)
12-hr	0.113 (0.098-0.132)	0.142 (0.123-0.166)	0.178 (0.154-0.208)	0.207 (0.178-0.241)	0.247 (0.209-0.286)	0.277 (0.232-0.320)	0.308 (0.254-0.356)	0.339 (0.276-0.392)	0.379 (0.302-0.441)	0.410 (0.321-0.479)
24-hr	0.069 (0.061-0.080)	0.088 (0.078-0.101)	0.115 (0.101-0.132)	0.136 (0.120-0.156)	0.167 (0.145-0.191)	0.191 (0.164-0.219)	0.217 (0.184-0.250)	0.244 (0.204-0.283)	0.283 (0.231-0.331)	0.314 (0.253-0.371)
2-day	0.040 (0.035-0.046)	0.051 (0.045-0.059)	0.068 (0.059-0.078)	0.081 (0.071-0.093)	0.100 (0.086-0.115)	0.115 (0.098-0.132)	0.132 (0.111-0.152)	0.149 (0.124-0.173)	0.174 (0.142-0.204)	0.194 (0.155-0.229)
3-day	0.029 (0.025-0.033)	0.037 (0.033-0.042)	0.049 (0.043-0.056)	0.059 (0.052-0.068)	0.074 (0.064-0.084)	0.086 (0.073-0.098)	0.099 (0.083-0.113)	0.112 (0.094-0.130)	0.132 (0.108-0.154)	0.148 (0.119-0.175)
4-day	0.023 (0.021-0.027)	0.030 (0.026-0.034)	0.040 (0.035-0.046)	0.049 (0.042-0.055)	0.061 (0.053-0.069)	0.071 (0.061-0.081)	0.082 (0.069-0.094)	0.094 (0.078-0.109)	0.111 (0.091-0.130)	0.125 (0.101-0.148)
7-day	0.015 (0.013-0.018)	0.020 (0.017-0.023)	0.026 (0.023-0.030)	0.032 (0.028-0.037)	0.040 (0.035-0.046)	0.047 (0.040-0.054)	0.055 (0.046-0.063)	0.063 (0.052-0.074)	0.075 (0.061-0.088)	0.085 (0.067-0.101)
10-day	0.012 (0.010-0.013)	0.015 (0.013-0.017)	0.020 (0.018-0.023)	0.024 (0.021-0.028)	0.031 (0.026-0.035)	0.036 (0.030-0.041)	0.041 (0.035-0.047)	0.047 (0.039-0.055)	0.056 (0.045-0.065)	0.063 (0.050-0.075)
20-day	0.007 (0.007-0.008)	0.010 (0.008-0.011)	0.013 (0.011-0.015)	0.015 (0.013-0.017)	0.019 (0.016-0.021)	0.022 (0.019-0.025)	0.024 (0.021-0.028)	0.027 (0.023-0.032)	0.032 (0.026-0.037)	0.035 (0.029-0.041)
30-day	0.006 (0.005-0.007)	0.008 (0.007-0.009)	0.010 (0.009-0.011)	0.012 (0.011-0.014)	0.015 (0.013-0.017)	0.017 (0.015-0.019)	0.019 (0.016-0.022)	0.021 (0.018-0.025)	0.025 (0.021-0.029)	0.027 (0.022-0.032)
45-day	0.005 (0.004-0.005)	0.006 (0.005-0.007)	0.008 (0.007-0.009)	0.010 (0.008-0.011)	0.012 (0.010-0.013)	0.013 (0.012-0.015)	0.015 (0.013-0.017)	0.017 (0.014-0.020)	0.020 (0.016-0.023)	0.022 (0.018-0.025)
60-day	0.004 (0.004-0.005)	0.005 (0.005-0.006)	0.007 (0.006-0.008)	0.008 (0.007-0.009)	0.010 (0.009-0.011)	0.011 (0.010-0.013)	0.013 (0.011-0.014)	0.014 (0.012-0.016)	0.016 (0.013-0.019)	0.017 (0.014-0.020)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

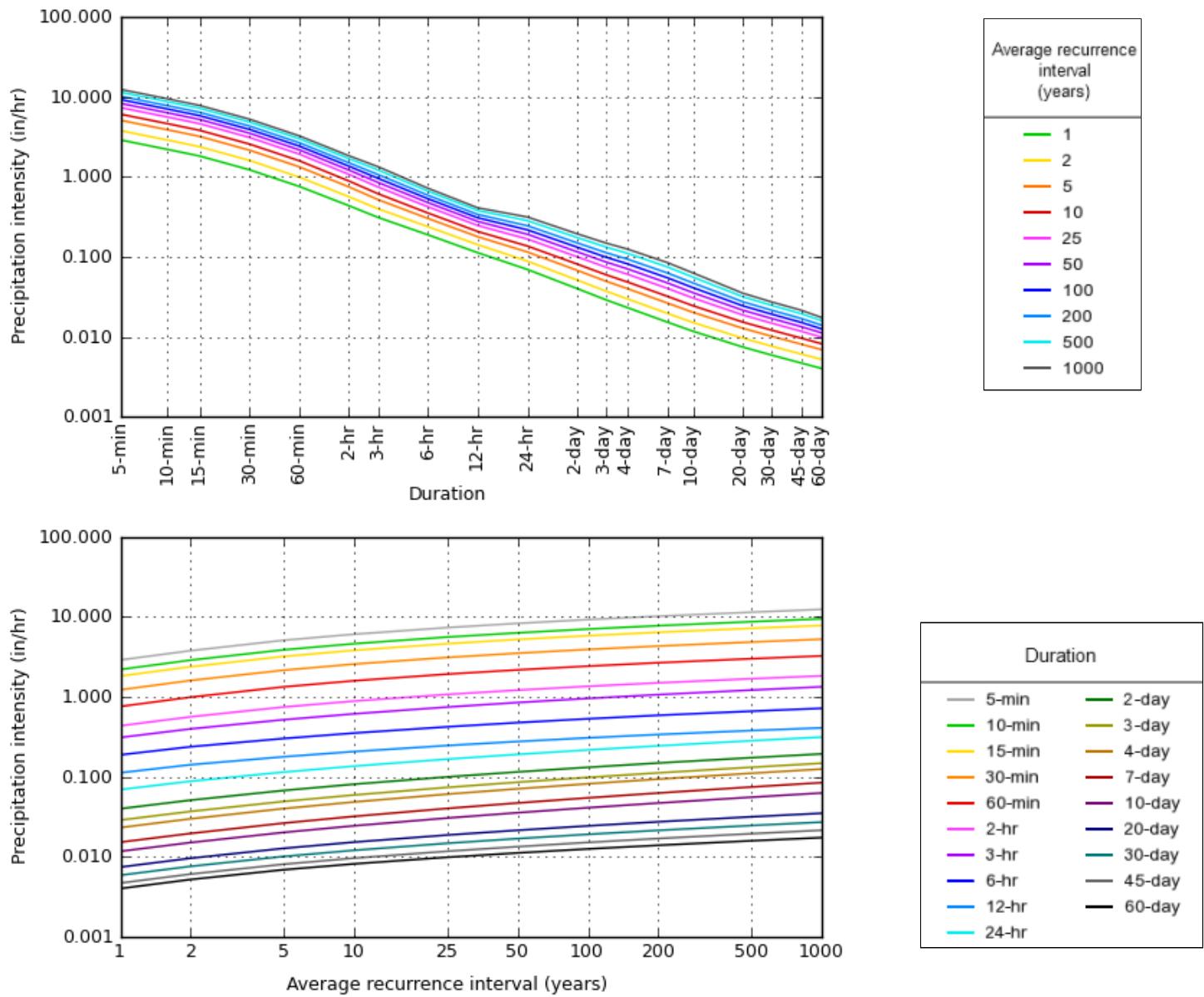
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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PF graphical

PDS-based intensity-duration-frequency (IDF) curves
Latitude: 33.7100°, Longitude: -111.8000°



NOAA Atlas 14, Volume 1, Version 5

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APPENDIX II

Calculations

*8280 E. Gelding Dr., Suite 101
Scottsdale, AZ 85260*

Existing Outlet Discharge Calculation				
	Inflow	Area(ac)	Cw	Total Outflow (CFS)
	Inlet 1-1	0.00	0.00	58
	Inlet 1-2	0.00	0.00	112
To CP 1-OUT	EX-7	1.54	0.45	6 176
To CP 2-OUT	EX-6	0.72	0.45	3 3
To CP 3-OUT	EX-1	1.33	0.45	6 6
	Inlet 2-1	0.00	0.00	322
	Inlet 2-2	0.00	0.00	3
	Inlet 2-3	0.00	0.00	24
	Inlet 2-4	0.00	0.00	21
To CP 4-OUT	EX-2	16.30	0.45	43 413
	Inlet 3-1	0.00	0.00	14
	Inlet 3-2	0.00	0.00	10
To CP 5-OUT	EX-3	14.84	0.45	47 71
To CP 6-OUT	EX-8	0.48	0.45	2 2
To CP 7-OUT	EX-9	0.96	0.45	4 4
	EX-4	2.82	0.45	9
To CP 8-OUT	Inlet 4-1	0.00	0.00	173 182
To CP 9-OUT	EX-5	0.52	0.45	2 2
				TOTAL 858.74

Proposed Outlet Discharge Calculation						
	DA	Area(ac)	Cw	Q (CFS)	Inflow (CFS)	Total Outflow (CFS)
To CP 1-OUT	DA1	0.95	0.45	4	170	174
To CP 4-OUT	DA5	2.83	0.45	12	349	366
	DA5A	1.18	0.45	5		
To CP 5-OUT	DA11A	1.19	0.45	5	45	55
	DA10	1.33	0.45	6		
To CP 8-OUT	DA14	0.90	0.45	4	173	177
	TOTAL	7.43				

PROPOSED RETENTION VOLUME CALCULATIONS

BASIN 1					
ELEV.	AREA (SF)	DEPTH (FT)	Avg Volume (CF)	Sum Volume (CF)	Comment
2657.00	10,688	1.00	11,841.00	0.00	
2658.00	12,994	1.00	11,841.00	11,841.00	
2659.00	15,413	1.00	14,203.50	26,044.50	
2660.00	17,939	1.00	16,676.00	42,720.50	

BASIN 3					
ELEV.	AREA (SF)	DEPTH (FT)	Avg Volume (CF)	Sum Volume (CF)	Comment
2661.00	36	1.00	430.50	0.00	
2662.00	825	1.00	1,319.50	430.50	
2663.00	1,814	1.00	2,414.00	1,750.00	
2664.00	3,014	1.00	4,164.00	4,164.00	

BASIN 2

BASIN 2					
ELEV.	AREA (SF)	DEPTH (FT)	Avg Volume (CF)	Sum Volume (CF)	Comment
2643.00	9,604	1.00	10,667.00	0.00	
2644.00	11,730	1.00	10,667.00	10,667.00	
2645.00	13,970	1.00	12,855.00	23,517.00	
2646.00	16,289	1.00	15,129.50	15,129.50	

BASIN 4

BASIN 4					
ELEV.	AREA (SF)	DEPTH (FT)	Avg Volume (CF)	Sum Volume (CF)	Comment
2665.00	1,024	1.00	1,401.50	0.00	
2666.00	1,779	1.00	2,220.50	1,401.50	
2667.00	2,662	1.00	3,168.00	3,632.00	
2668.00	3,674	1.00	6,790.00	6,790.00	

BASIN 5

BASIN 5					
ELEV.	AREA (SF)	DEPTH (FT)	Avg Volume (CF)	Sum Volume (CF)	Comment
2665.00	709	1.00	991.00	0.00	
2666.00	1,273	1.00	1,619.50	991.00	
2667.00	1,966	1.00	2,352.00	2,610.50	
TOTAL	97,284	88,919	2,738	4,962.50	

REQUIRED RETENTION VOLUME SUMMARY

PROVIDED RETENTION VOLUME SUMMARY		REQUIRED RETENTION VOLUME SUMMARY	
BASIN ID	VOLUME PROVIDED (C.F.)	BASIN ID	VOLUME PROVIDED (C.F.)
1	42,721	1	42,167
2	38,647	2	36,708
3	4,164	3	3,607
4	6,790	4	4,819
5	4,963	5	1,618
TOTAL	97,284	TOTAL	88,919

Required Storage Volume Calculations						
						Vr=1*(P/12)*Cw*A P=100-yr, 2-hr=2.65 in.
Drainage Area ID	Disturbed (acres)	C _w (-)	intensity (in/hr)	Q-100 (cfs)	Volume Req. (acre-ft)	Volume Req. (CF)
RETENTION BASIN 1						
DA9	0.71	0.53	9.25	3.51	0.086	3,735.13
DA11	2.88	0.54	9.25	14.45	0.353	15,365.40
DA11B	0.97	0.58	9.25	5.22	0.127	5,549.02
DA12	1.70	0.95	9.25	14.94	0.365	15,887.24
DA13	0.35	0.47	9.25	1.53	0.037	1,630.39
Basin 1 Totals:	5.90	0.73		36.14	0.882	42,167.18
RETENTION BASIN 2						
DA3	1.12	0.95	9.25	9.84	0.240	10,466.89
DA6	0.52	0.50	9.25	2.40	0.059	2,549.37
DA7	1.58	0.54	9.25	7.90	0.193	8,397.63
DA8	1.90	0.60	9.25	10.46	0.255	11,125.29
DA8A	1.04	0.52	9.25	4.99	0.122	5,304.43
Basin 2 Totals:	4.52	0.79		23.35	0.570	37,843.61
Retention Basin 3						
DA4	0.71	0.52	9.25	3.39	0.083	3,607.02
Basin 3 Totals:	0.71	0.52		3.39	0.083	3,607.02
Retention Basin 4						
DA2	0.93	0.53	9.25	4.53	0.111	4,818.62
Basin 4 Totals:	0.93	0.53		4.53	0.111	4,818.62
Retention Basin 5						
DA15	0.33	0.50	9.25	1.52	0.037	1,618.09
Basin 6 Totals:	0.33	0.50		1.52	0.037	1,618.09
Totals	10.42			59.48	1.45	90,054.52

Pond Routing Calculations

REQUIRED STORAGE: 100-yr Event BASIN 2

Tc (min.)	I100	A (ac)	C	Q(in) (cfs)	Q (out) (cfs)	Qi-QoxTcx60 (cf)
5	9.25	4.52	0.79	33.03	0.35	9803.97
10	7.04	4.52	0.79	25.14	0.35	14873.06
15	5.82	4.52	0.79	20.78	0.35	18388.85
30	3.92	4.52	0.79	14.00	0.35	24565.56
60	2.42	4.52	0.79	8.64	0.35	29848.81
120	1.36	4.52	0.79	4.86	0.35	32445.27
180	0.956	4.52	0.79	3.41	0.35	33087.80
360	0.532	4.52	0.79	1.90	0.35	33472.78
720	0.308	4.52	0.79	1.10	0.35	32391.64
1440	0.217	4.52	0.79	0.77	0.35	36708.22

EXISTING CONDITION

Tc (min.)	I100	A (ac)	C	Q (cfs)
5	9.25	4.52	0.45	18.81
10	7.04	4.52	0.45	14.32
15	5.82	4.52	0.45	11.84
30	3.92	4.52	0.45	7.97
60	2.42	4.52	0.45	4.92
120	1.36	4.52	0.45	2.77
180	0.956	4.52	0.45	1.94
360	0.532	4.52	0.45	1.08
720	0.308	4.52	0.45	0.63
1440	0.217	4.52	0.45	0.44

WEIGHTED RUNOFF COEFFICIENTS					
DA	Area(ac)	Desert Landscape Cwt = 0.45	Concrete/Asp halt/ Roof Cwt = 0.61	Roadway Cwt=0.95	Cw
1	0.95	0.95	0.00	0.00	0.45
2	1.94	1.01	0.93	0.00	0.53
3	1.12	0.00	0.00	1.12	0.95
4	1.71	1.00	0.71	0.00	0.52
5	2.83	2.83	0.00	0.00	0.45
5A	1.18	1.18	0.00	0.00	0.45
6	1.72	1.20	0.52	0.00	0.50
7	2.8	1.22	1.58	0.00	0.54
8	3.10	1.20	1.47	0.43	0.60
8A	2.43	1.39	1.04	0.00	0.52
9	1.34	0.63	0.71	0.00	0.53
10	1.33	1.33	0.00	0.00	0.45
11	4.99	2.11	2.88	0.00	0.54
11A	0.57	0.57	0.00	0.00	0.45
11B	1.18	0.21	0.97	0.00	0.58
12	1.70	0.00	0.00	1.70	0.95
13	2.38	2.03	0.35	0.00	0.47
14	0.90	0.90	0.00	0.00	0.45
15	1.09	0.76	0.33	0.00	0.50

EXISTING DRAINAGE AREAS TIME OF CONCENTRATION

EX1

$T_c = 11.4L^{0.5}K_b^{0.52}S^{-0.31}i^{-0.38}$	0.089 Hours	5.31 Min.
L= 0.07 MILES		
$K_b = 0.1469$	$m \log_{10}A+b =$	
S= 220.00 FT/MILE		
i= 9.250 IN/HR	From NOAA	
$m = -0.025$	From Table 3.1 of FCDMC Hydrology Manual (Type C)	
b= 0.15	From Table 3.1 of FCDMC Hydrology Manual (Type C)	
A= 1.33 ACRES		
$Q=CiA$	5.5361 CFS	
C= 0.45		
i= 9.250 IN/HR		
A= 1.33 ACRES		

EX2

$T_c = 11.4L^{0.5}K_b^{0.52}S^{-0.31}i^{-0.38}$	0.252 Hours	15.11 Min.
L= 0.32 MILES		
$K_b = 0.1197$	$m \log_{10}A+b =$	
S= 112.50 FT/MILE		
i= 5.820 IN/HR	From NOAA	
$m = -0.025$	From Table 3.1 of FCDMC Hydrology Manual (Type C)	
b= 0.15	From Table 3.1 of FCDMC Hydrology Manual (Type C)	
A= 16.30 ACRES		
$Q=CiA$	42.6897 CFS	
C= 0.45		
i= 5.820 IN/HR		
A= 16.30 ACRES		

EX3

$T_c = 11.4L^{0.5}K_b^{0.52}S^{-0.31}i^{-0.38}$	0.196 Hours	11.78 Min.
L= 0.28 MILES		
$K_b = 0.1207$	$m \log_{10}A+b =$	
S= 165.43 FT/MILE		
i= 7.040 IN/HR	From NOAA	
$m = -0.025$	From Table 3.1 of FCDMC Hydrology Manual (Type C)	
b= 0.15	From Table 3.1 of FCDMC Hydrology Manual (Type C)	
A= 14.84 ACRES		
$Q=CiA$	47.0131 CFS	
C= 0.45		
i= 7.040 IN/HR		

A=	14.84 ACRES
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EX4

$T_c = 11.4L^{0.5}K_b^{0.52}S^{-0.31}i^{-0.38}$	0.134 Hours	8.06 Min.
L=	0.11 MILES	
$K_b =$	0.1387	$m \log_{10}A + b =$
S=	154.55 FT/MILE	
i=	7.040 IN/HR	From NOAA
$m =$	-0.025	From Table 3.1 of FCDMC Hydrology Manual (Type C)
b=	0.15	From Table 3.1 of FCDMC Hydrology Manual (Type C)
A=	2.82 ACRES	
Q=CiA	8.9338 CFS	
C=	0.45	
i=	7.040 IN/HR	
A=	2.82 ACRES	

EX5

$T_c = 11.4L^{0.5}K_b^{0.52}S^{-0.31}i^{-0.38}$	0.075 Hours	4.51 Min.
L=	0.04 MILES	
$K_b =$	0.1571	$m \log_{10}A + b =$
S=	154.55 FT/MILE	
i=	9.250 IN/HR	From NOAA
$m =$	-0.025	From Table 3.1 of FCDMC Hydrology Manual (Type C)
b=	0.15	From Table 3.1 of FCDMC Hydrology Manual (Type C)
A=	0.52 ACRES	
Q=CiA	2.1645 CFS	
C=	0.45	
i=	9.250 IN/HR	
A=	0.52 ACRES	

EX6

$T_c = 11.4L^{0.5}K_b^{0.52}S^{-0.31}i^{-0.38}$	0.076 Hours	4.55 Min.
L=	0.05 MILES	
$K_b =$	0.1536	$m \log_{10}A + b =$
S=	274.05 FT/MILE	
i=	9.250 IN/HR	From NOAA
$m =$	-0.025	From Table 3.1 of FCDMC Hydrology Manual (Type C)
b=	0.15	From Table 3.1 of FCDMC Hydrology Manual (Type C)
A=	0.72 ACRES	
Q=CiA	2.9970 CFS	
C=	0.45	
i=	9.250 IN/HR	
A=	0.72 ACRES	

EX7

$T_c = 11.4L^{0.5}K_b^{0.52}S^{-0.31}i^{-0.38} =$	0.120 Hours	7.19 Min.
L= 0.08 MILES		
K _b = 0.1453		$m \log_{10}A+b=$
S= 105.60 FT/MILE		
i= 9.250 IN/HR		From NOAA
m = -0.025		From Table 3.1 of FCDMC Hydrology Manual (Type C)
b= 0.15		From Table 3.1 of FCDMC Hydrology Manual (Type C)
A= 1.54 ACRES		
Q=CiA 6.4103 CFS		
C= 0.45		
i= 9.250 IN/HR		
A= 1.54 ACRES		

EX8

$T_c = 11.4L^{0.5}K_b^{0.52}S^{-0.31}i^{-0.38} =$	0.068 Hours	4.09 Min.
L= 0.05 MILES		
K _b = 0.1580		$m \log_{10}A+b=$
S= 312.80 FT/MILE		
i= 9.250 IN/HR		From NOAA
m = -0.025		From Table 3.1 of FCDMC Hydrology Manual (Type C)
b= 0.15		From Table 3.1 of FCDMC Hydrology Manual (Type C)
A= 0.48 ACRES		
Q=CiA 1.9980 CFS		
C= 0.45		
i= 9.250 IN/HR		
A= 0.48 ACRES		

EX9

$T_c = 11.4L^{0.5}K_b^{0.52}S^{-0.31}i^{-0.38} =$	0.090 Hours	5.42 Min.
L= 0.07 MILES		
K _b = 0.1504		$m \log_{10}A+b=$
S= 232.86 FT/MILE		
i= 9.250 IN/HR		From NOAA
m = -0.025		From Table 3.1 of FCDMC Hydrology Manual (Type C)
b= 0.15		From Table 3.1 of FCDMC Hydrology Manual (Type C)
A= 0.96 ACRES		

Q=CiA 3.9960 CFS
C= 0.45
i= 9.250 IN/HR
A= 0.96 ACRES

PROPOSED DRAINAGE AREAS TIME OF CONCENTRATION

DA1

$T_c = 11.4 L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38} =$	0.103 Hours	6.16 Min.
L=	0.07 MILES	
K _b =	0.1506	$m \log_{10} A + b =$
S=	135.77 FT/MILE	
i=	9.250 IN/HR	From NOAA
m =	-0.025	From Table 3.1 of FCDMC Hydrology Manual (Type C)
b=	0.15	From Table 3.1 of FCDMC Hydrology Manual (Type C)
A=	0.95 ACRES	
Q=CiA	3.95 CFS	
C=	0.45	
i=	9.250 IN/HR	
A=	0.95 ACRES	

DA2

$T_c = 11.4 L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38} =$	0.130 Hours	7.81 Min.
L=	0.07 MILES	
K _b =	0.1428	$m \log_{10} A + b =$
S=	68.22 FT/MILE	
i=	9.250 IN/HR	From NOAA
m =	-0.025	From Table 3.1 of FCDMC Hydrology Manual (Type C)
b=	0.15	From Table 3.1 of FCDMC Hydrology Manual (Type C)
A=	1.94 ACRES	
Q=CiA	9.51 CFS	
C=	0.53	
i=	9.250 IN/HR	
A=	1.94 ACRES	

DA3

$T_c = 11.4 L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38} =$	0.137 Hours	8.23 Min.
L=	0.09 MILES	
K _b =	0.1488	$m \log_{10} A + b =$
S=	87.63 FT/MILE	
i=	9.250 IN/HR	From NOAA
m =	-0.025	From Table 3.1 of FCDMC Hydrology Manual (Type C)
b=	0.15	From Table 3.1 of FCDMC Hydrology Manual (Type C)
A=	1.12 ACRES	
Q=CiA	9.84 CFS	
C=	0.95	
i=	9.250 IN/HR	
A=	1.12 ACRES	

DA4

$T_c = 11.4 L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38}$	0.106 Hours	6.36 Min.
L= 0.06 MILES		
K _b = 0.1442		$m \log_{10} A + b =$
S= 99.00 FT/MILE		
i= 9.250 IN/HR		From NOAA
m = -0.025		From Table 3.1 of FCDMC Hydrology Manual (Type C)
b= 0.15		From Table 3.1 of FCDMC Hydrology Manual (Type C)
A= 1.71 ACRES		
Q=CiA 8.23 CFS		
C= 0.52		
i= 9.250 IN/HR		
A= 1.71 ACRES		

DA5

$T_c = 11.4 L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38}$	0.183 Hours	10.99 Min.
L= 0.17 MILES		
K _b = 0.1387		$m \log_{10} A + b =$
S= 117.33 FT/MILE		
i= 7.040 IN/HR		From NOAA
m = -0.025		From Table 3.1 of FCDMC Hydrology Manual (Type C)
b= 0.15		From Table 3.1 of FCDMC Hydrology Manual (Type C)
A= 2.83 ACRES		
Q=CiA 8.97 CFS		
C= 0.45		
i= 7.040 IN/HR		
A= 2.83 ACRES		

DA5A

$T_c = 11.4 L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38}$	0.133 Hours	7.95 Min.
L= 0.12 MILES		
K _b = 0.1482		$m \log_{10} A + b =$
S= 154.55 FT/MILE		
i= 9.250 IN/HR		From NOAA
m = -0.025		From Table 3.1 of FCDMC Hydrology Manual (Type C)
b= 0.15		From Table 3.1 of FCDMC Hydrology Manual (Type C)
A= 1.18 ACRES		
Q=CiA 4.91 CFS		
C= 0.45		
i= 9.250 IN/HR		
A= 1.18 ACRES		

DA6

$T_c = 11.4 L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38}$	0.094 Hours	5.66 Min.
L=	0.06 MILES	
K _b =	0.1441	$m \log_{10} A + b =$
S=	156.68 FT/MILE	
i=	9.250 IN/HR	From NOAA
m =	-0.025	From Table 3.1 of FCDMC Hydrology Manual (Type C)
b=	0.15	From Table 3.1 of FCDMC Hydrology Manual (Type C)
A=	1.72 ACRES	
Q=CiA	7.96 CFS	
C=	0.5	
i=	9.250 IN/HR	
A=	1.72 ACRES	

DA7

$T_c = 11.4 L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38}$	0.141 Hours	8.45 Min.
L=	0.14 MILES	
K _b =	0.1388	$m \log_{10} A + b =$
S=	142.90 FT/MILE	
i=	9.250 IN/HR	From NOAA
m =	-0.025	From Table 3.1 of FCDMC Hydrology Manual (Type C)
b=	0.15	From Table 3.1 of FCDMC Hydrology Manual (Type C)
A=	2.80 ACRES	
Q=CiA	13.99 CFS	
C=	0.54	
i=	9.250 IN/HR	
A=	2.80 ACRES	

DA8

$T_c = 11.4 L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38}$	0.219 Hours	13.13 Min.
L=	0.12 MILES	
K _b =	0.1377	$m \log_{10} A + b =$
S=	34.74 FT/MILE	
i=	7.040 IN/HR	From NOAA
m =	-0.025	From Table 3.1 of FCDMC Hydrology Manual (Type C)
b=	0.15	From Table 3.1 of FCDMC Hydrology Manual (Type C)
A=	3.10 ACRES	
Q=CiA	13.09 CFS	
C=	0.60	
i=	7.040 IN/HR	
A=	3.10 ACRES	

DA8A

$T_c = 11.4 L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38}$	0.113 Hours	6.76 Min.
L=	0.06 MILES	
K _b =	0.1404	$m \log_{10} A + b =$
S=	70.17 FT/MILE	

i=	9.250 IN/HR	From NOAA
m =	-0.025	From Table 3.1 of FCDMC Hydrology Manual (Type C)
b=	0.15	From Table 3.1 of FCDMC Hydrology Manual (Type C)
A=	2.43 ACRES	
Q=CiA	11.69 CFS	
C=	0.52	
i=	9.250 IN/HR	
A=	2.43 ACRES	

DA9

$T_c = 11.4 L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38}$	0.070 Hours	4.22 Min.
L=	0.06 MILES	
K _b =	0.1468	$m \log_{10} A + b =$
S=	369.94 FT/MILE	
i=	9.250 IN/HR	From NOAA
m =	-0.025	From Table 3.1 of FCDMC Hydrology Manual (Type C)
b=	0.15	From Table 3.1 of FCDMC Hydrology Manual (Type C)
A=	1.34 ACRES	
Q=CiA	6.57 CFS	
C=	0.53	
i=	9.250 IN/HR	
A=	1.34 ACRES	

DA10

$T_c = 11.4 L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38}$	0.318 Hours	19.07 Min.
L=	0.16 MILES	
K _b =	0.1469	$m \log_{10} A + b =$
S=	23.84 FT/MILE	
i=	5.820 IN/HR	From NOAA
m =	-0.025	From Table 3.1 of FCDMC Hydrology Manual (Type C)
b=	0.15	From Table 3.1 of FCDMC Hydrology Manual (Type C)
A=	1.33 ACRES	
Q=CiA	3.48 CFS	
C=	0.45	
i=	5.820 IN/HR	
A=	1.33 ACRES	

DA11

$T_c = 11.4 L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38}$	0.179 Hours	10.75 Min.
L=	0.19 MILES	
K _b =	0.1325	$m \log_{10} A + b =$
S=	134.42 FT/MILE	
i=	7.040 IN/HR	From NOAA
m =	-0.025	From Table 3.1 of FCDMC Hydrology Manual (Type C)
b=	0.15	From Table 3.1 of FCDMC Hydrology Manual (Type C)

A=	4.99 ACRES
Q=CiA	5.67 CFS
C=	0.54
i=	7.040 IN/HR
A=	4.99 ACRES

DA11A

$T_c = 11.4 L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38}$	0.334 Hours	20.03 Min.
L=	0.33 MILES	
K _b =	0.1561	$m \log_{10} A + b =$
S=	75.76 FT/MILE	
i=	5.820 IN/HR	From NOAA
m =	-0.025	From Table 3.1 of FCDMC Hydrology Manual (Type C)
b=	0.15	From Table 3.1 of FCDMC Hydrology Manual (Type C)
A=	0.57 ACRES	
Q=CiA	1.49 CFS	
C=	0.45	
i=	5.820 IN/HR	
A=	0.57 ACRES	

DA11B

$T_c = 11.4 L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38}$	0.339 Hours	20.35 Min.
L=	0.25 MILES	
K _b =	0.1436	$m \log_{10} A + b =$
S=	40.00 FT/MILE	
i=	5.820 IN/HR	From NOAA
m =	-0.025	From Table 3.1 of FCDMC Hydrology Manual (Type C)
b=	0.15	From Table 3.1 of FCDMC Hydrology Manual (Type C)
A=	1.80 ACRES	
Q=CiA	6.08 CFS	
C=	0.58	
i=	5.820 IN/HR	
A=	1.80 ACRES	

DA12

$T_c = 11.4 L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38}$	0.207 Hours	12.44 Min.
L=	0.17 MILES	
K _b =	0.1442	$m \log_{10} A + b =$
S=	86.46 FT/MILE	
i=	7.040 IN/HR	From NOAA
m =	-0.025	From Table 3.1 of FCDMC Hydrology Manual (Type C)
b=	0.15	From Table 3.1 of FCDMC Hydrology Manual (Type C)
A=	1.70 ACRES	
Q=CiA	11.37 CFS	
C=	0.95	

i=	7.040 IN/HR
A=	1.70 ACRES

DA13

$T_c = 11.4 L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38}$	0.178 Hours	10.66 Min.
L=	0.05 MILES	
K _b =	0.1406	$m \log_{10} A + b =$
S=	19.34 FT/MILE	
i=	7.040 IN/HR	From NOAA
m =	-0.025	From Table 3.1 of FCDMC Hydrology Manual (Type C)
b=	0.15	From Table 3.1 of FCDMC Hydrology Manual (Type C)
A=	2.38 ACRES	
Q=CiA	7.87 CFS	
C=	0.47	
i=	7.040 IN/HR	
A=	2.38 ACRES	

DA14

$T_c = 11.4 L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38}$	0.132 Hours	7.95 Min.
L=	0.10 MILES	
K _b =	0.1511	$m \log_{10} A + b =$
S=	112.56 FT/MILE	
i=	9.250 IN/HR	From NOAA
m =	-0.025	From Table 3.1 of FCDMC Hydrology Manual (Type C)
b=	0.15	From Table 3.1 of FCDMC Hydrology Manual (Type C)
A=	0.90 ACRES	
Q=CiA	3.75 CFS	
C=	0.45	
i=	9.250 IN/HR	
A=	0.90 ACRES	

DA15

$T_c = 11.4 L^{0.5} K_b^{0.52} S^{-0.31} i^{-0.38}$	0.067 Hours	4.03 Min.
L=	0.04 MILES	
K _b =	0.1491	$m \log_{10} A + b =$
S=	243.32 FT/MILE	
i=	9.250 IN/HR	From NOAA
m =	-0.025	From Table 3.1 of FCDMC Hydrology Manual (Type C)
b=	0.15	From Table 3.1 of FCDMC Hydrology Manual (Type C)
A=	1.09 ACRES	
Q=CiA	5.04 CFS	
C=	0.50	
i=	9.250 IN/HR	
A=	1.09 ACRES	

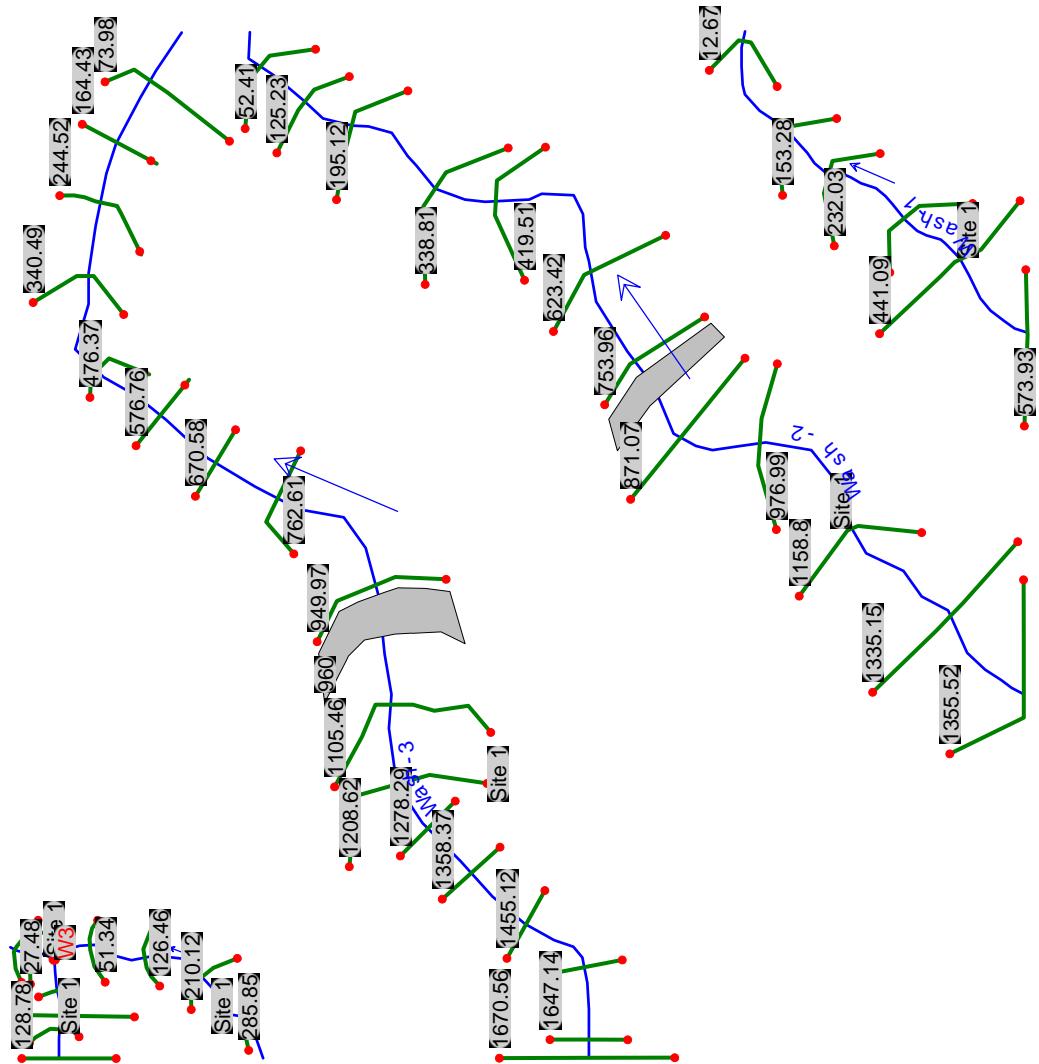
Proposed HEC-RAS Model

*8280 E. Gelding Dr., Suite 101
Scottsdale, AZ 85260*

Sustainability Engineering Group

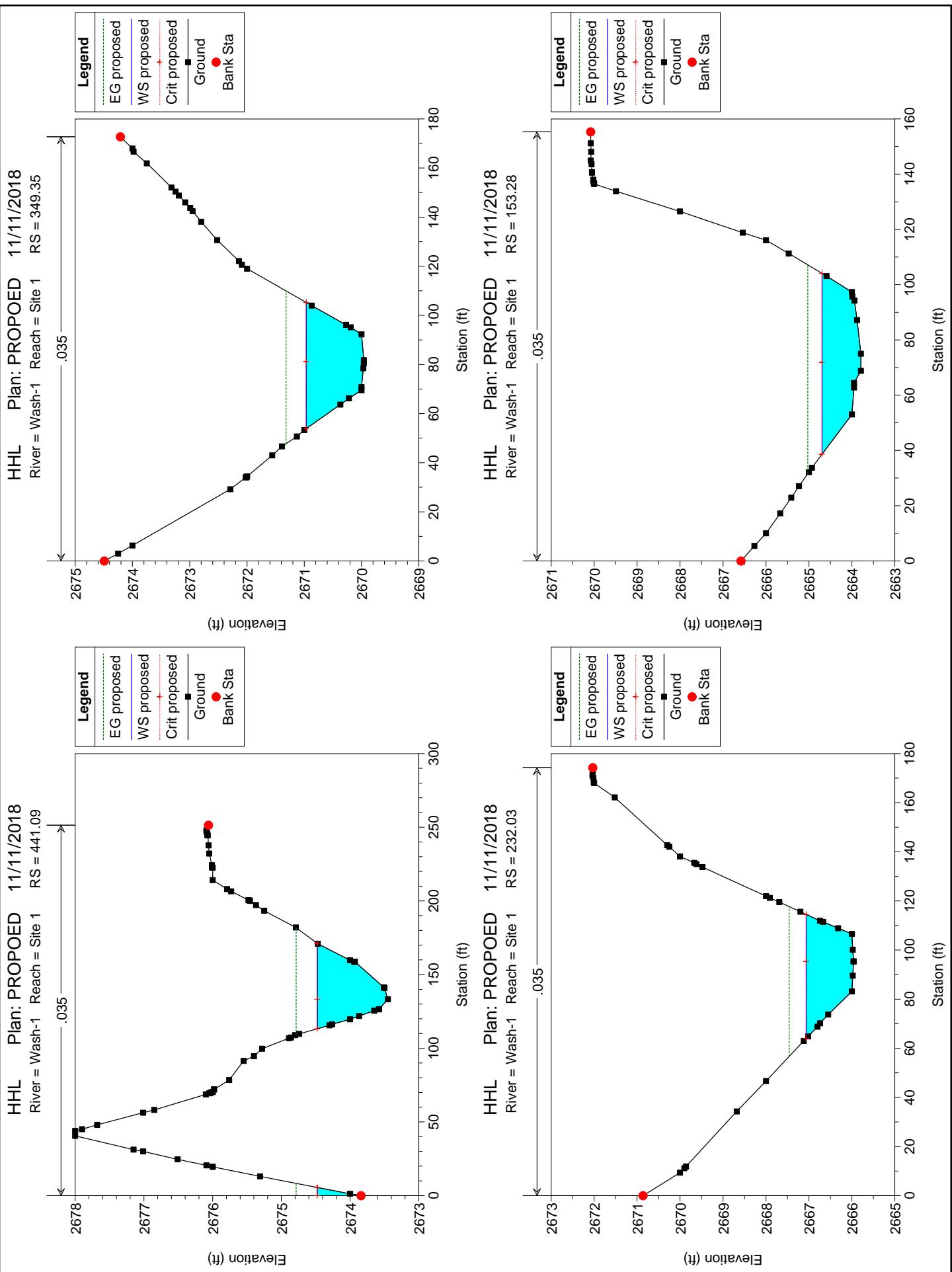
info@azSEG.com 480.588.7226 www.azSEG.com

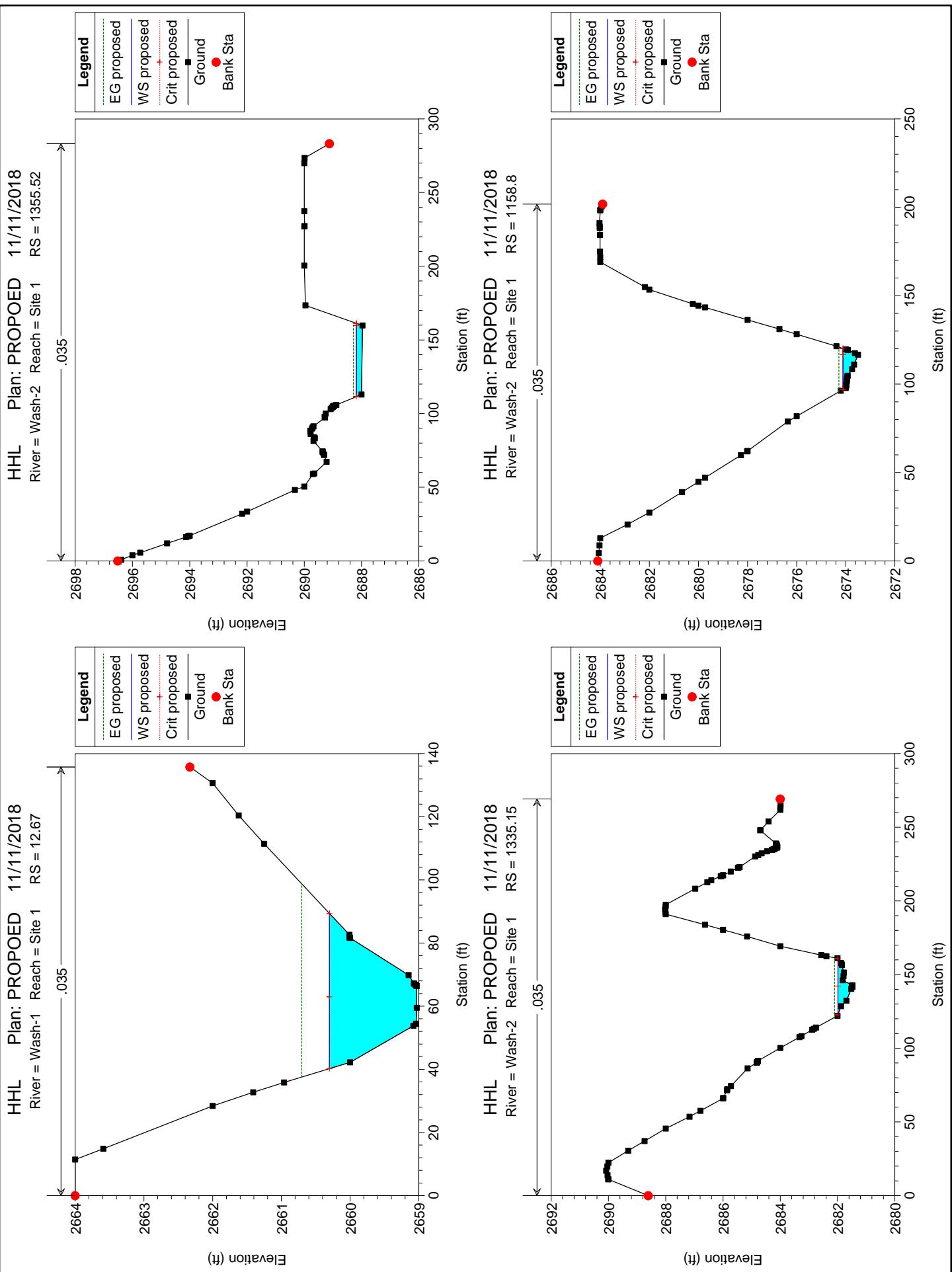
APPENDIX

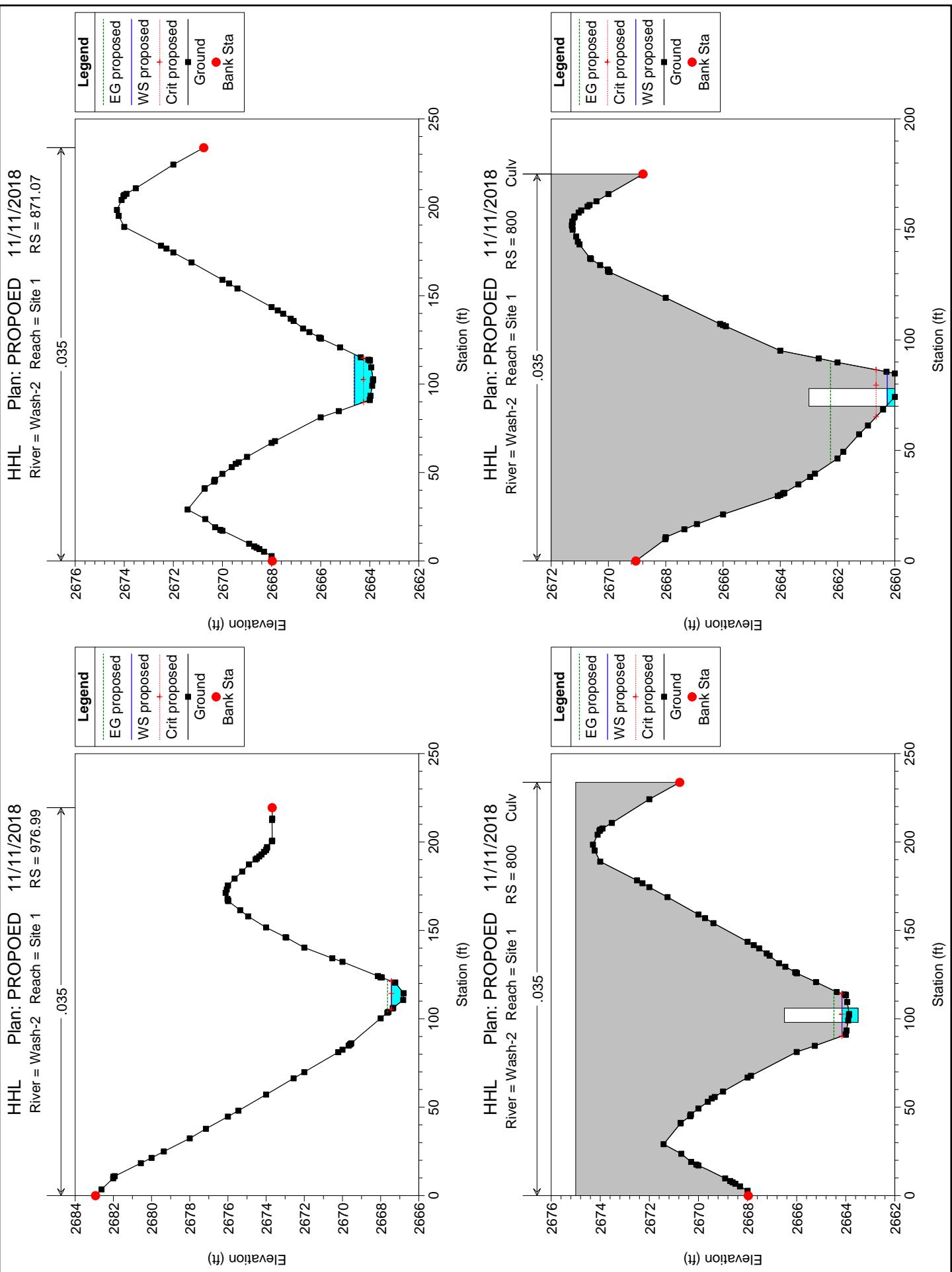


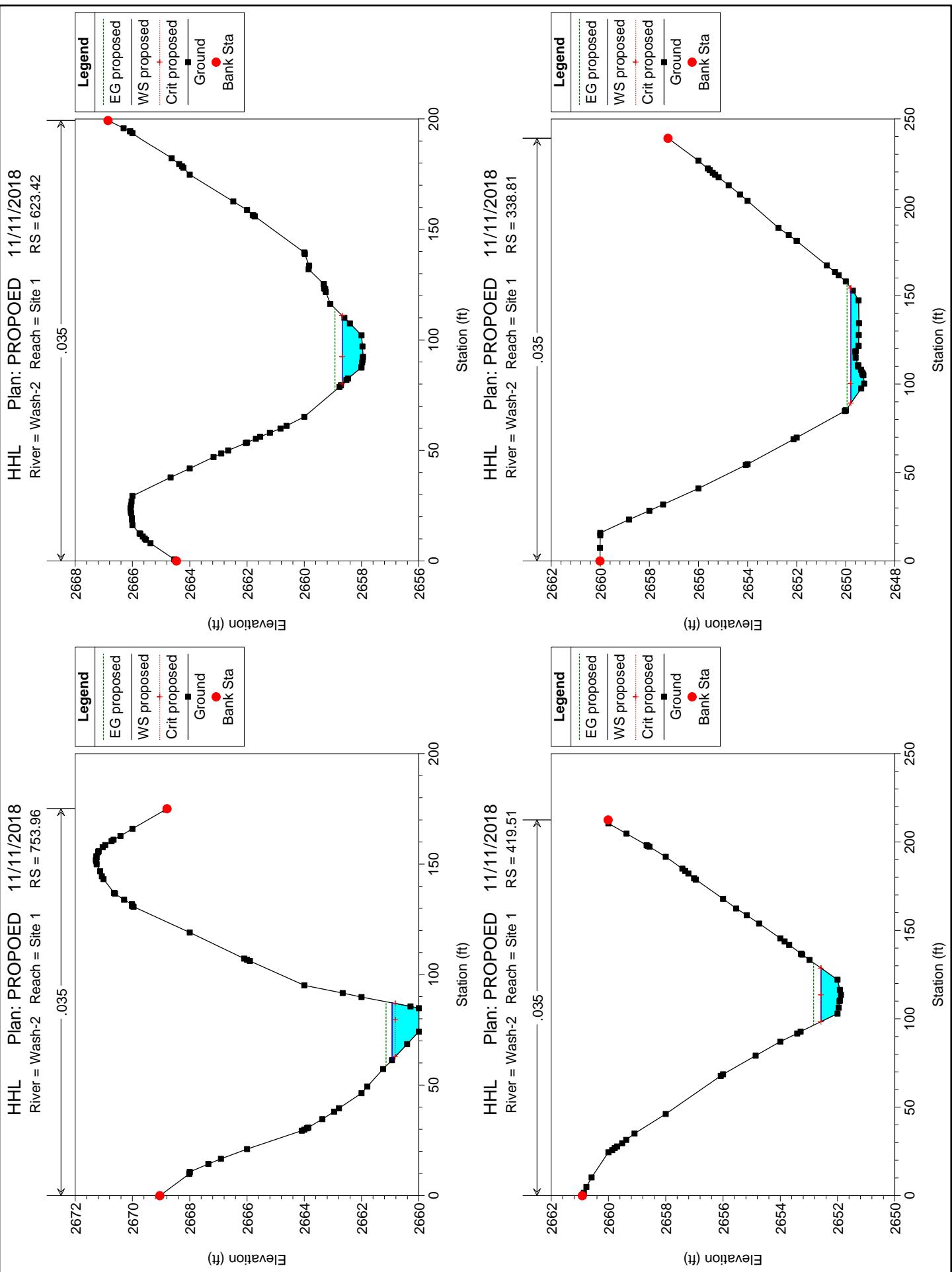
HEC-RAS Plan: PROPSOED Profile: proposed

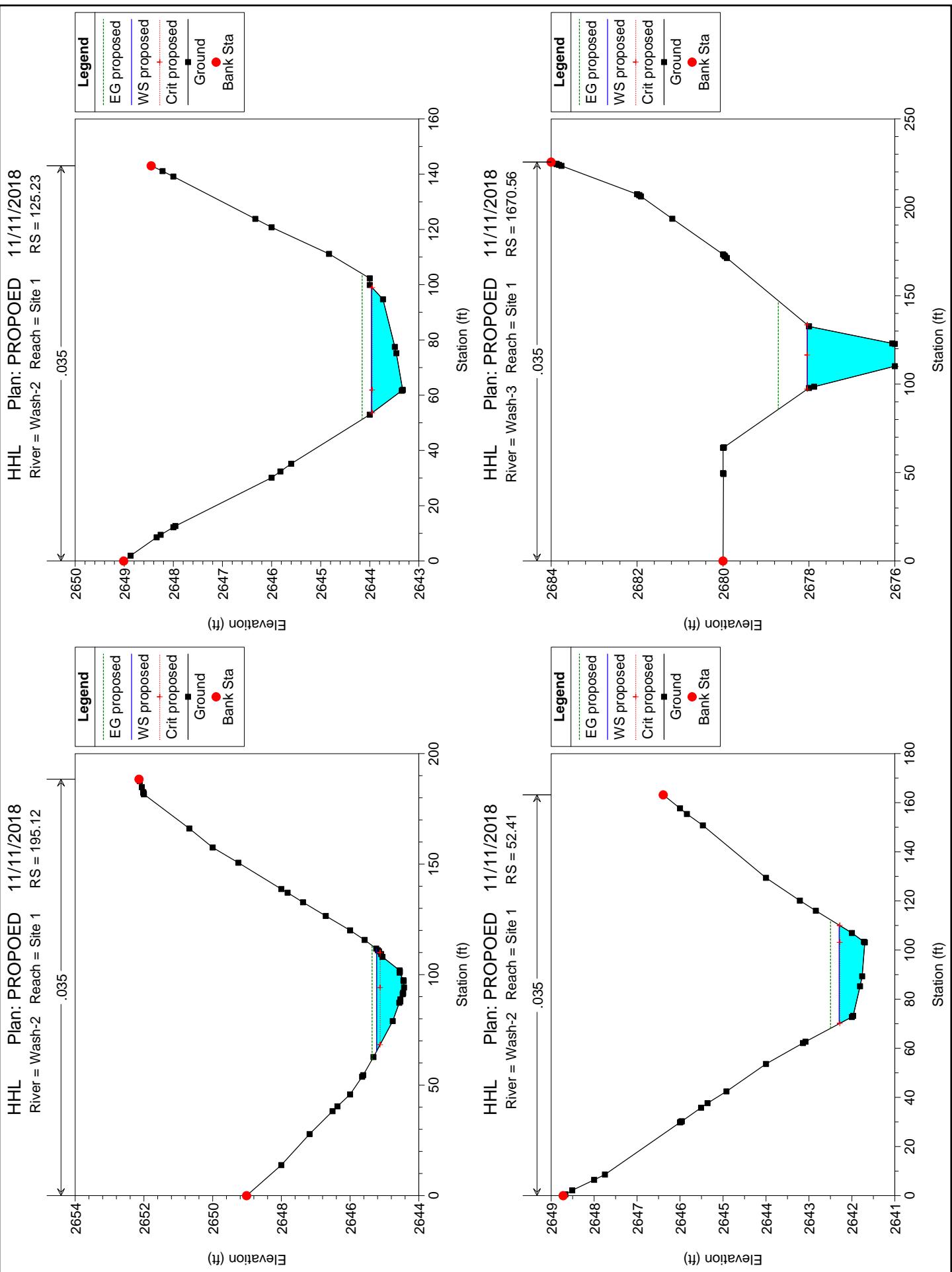
River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft/ft)	E.G. Slope (ft/s)	Vel Chnl (sq ft)	Flow Area (ft)	Top Width	Froude # Chl
Wash-4_Reach-3	Site 1	27.48	proposed	173.00	2666.41	2667.72	2667.72	2668.09	0.020462	4.84	35.73	50.11	1.01
Wash-4_Reach-3	Site 1	6.73	proposed	173.00	2666.00	2667.21	2667.21	2667.59	0.019952	4.96	34.90	46.34	1.01
Wash-4_Reach-2	Site 1	128.78	proposed	58.00	2671.93	2672.28	2672.28	2672.44	0.025919	3.17	18.31	57.97	0.99
Wash-4_Reach-2	Site 1	91.33	proposed	58.00	2669.98	2670.54		2670.65	0.010179	2.65	21.92	45.11	0.67
Wash-4_Reach-2	Site 1	73.67	proposed	58.00	2669.03	2669.67	2669.67	2669.87	0.025146	3.58	16.20	41.75	1.01
Wash-4_Reach-2	Site 1	40.94	proposed	58.00	2667.99	2668.71	2668.71	2668.94	0.023259	3.82	15.18	33.45	1.00
Wash-4_Reach-1	Site 1	285.85	proposed	112.00	2674.00	2674.91	2674.91	2675.24	0.021209	4.56	24.54	38.63	1.01
Wash-4_Reach-1	Site 1	210.12	proposed	112.00	2671.99	2673.16	2673.16	2673.51	0.020578	4.73	23.66	34.40	1.01
Wash-4_Reach-1	Site 1	126.46	proposed	112.00	2669.98	2671.01	2671.01	2671.39	0.020309	4.92	22.79	30.99	1.01
Wash-4_Reach-1	Site 1	51.34	proposed	112.00	2668.00	2669.35	2669.35	2669.70	0.021048	4.74	23.65	34.90	1.01
Wash-3	Site 1	1670.56	proposed	322.00	2676.00	2678.04	2678.04	2678.71	0.016424	6.58	48.91	36.39	1.00
Wash-3	Site 1	1647.14	proposed	322.00	2675.89	2677.66	2677.66	2678.23	0.017465	6.02	53.47	47.87	1.00
Wash-3	Site 1	1553.55	proposed	322.00	2673.96	2675.54	2675.54	2676.09	0.017639	5.94	54.21	49.97	1.01
Wash-3	Site 1	1455.12	proposed	322.00	2671.95	2673.38	2673.38	2673.90	0.018142	5.78	55.74	54.69	1.01
Wash-3	Site 1	1358.37	proposed	322.00	2669.75	2671.28	2671.28	2671.86	0.017321	6.11	52.68	45.83	1.01
Wash-3	Site 1	1278.29	proposed	322.00	2667.98	2669.30	2669.30	2669.72	0.019549	5.23	61.61	74.35	1.01
Wash-3	Site 1	1208.62	proposed	382.00	2666.00	2668.65		2668.69	0.001026	1.58	242.46	194.36	0.25
Wash-3	Site 1	1105.46	proposed	382.00	2663.99	2668.66	2665.04	2668.66	0.000034	0.56	685.73	201.20	0.05
Wash-3	Site 1	960		Culvert									
Wash-3	Site 1	949.97	proposed	382.00	2660.00	2660.79	2660.75	2661.09	0.017114	4.40	86.83	123.12	0.92
Wash-3	Site 1	762.61	proposed	382.00	2655.98	2657.25	2657.25	2657.73	0.018553	5.52	69.22	74.09	1.01
Wash-3	Site 1	670.58	proposed	382.00	2653.96	2655.34	2655.34	2655.81	0.018416	5.47	69.87	75.49	1.00
Wash-3	Site 1	576.76	proposed	382.00	2651.99	2652.97	2652.97	2653.36	0.019214	5.05	76.71	99.61	1.00
Wash-3	Site 1	476.37	proposed	382.00	2649.23	2650.47	2650.47	2650.84	0.020013	4.91	77.96	107.52	1.01
Wash-3	Site 1	340.49	proposed	382.00	2646.00	2647.89		2648.09	0.005618	3.56	107.29	90.56	0.58
Wash-3	Site 1	244.52	proposed	382.00	2645.87	2646.77	2646.77	2647.16	0.019647	4.99	76.91	101.65	1.00
Wash-3	Site 1	164.43	proposed	382.00	2643.95	2645.05	2645.05	2645.44	0.018907	5.02	76.67	99.70	0.99
Wash-3	Site 1	73.98	proposed	382.00	2641.44	2642.58	2642.56	2642.88	0.020001	4.44	85.94	134.85	0.98
Wash-2	Site 1	1355.52	proposed	24.00	2687.97	2688.18	2688.18	2688.28	0.031048	2.50	9.61	49.80	1.00
Wash-2	Site 1	1335.15	proposed	24.00	2681.48	2681.99	2681.99	2682.11	0.029864	2.75	8.74	38.11	1.01
Wash-2	Site 1	1158.8	proposed	24.00	2673.50	2674.11	2674.11	2674.28	0.027329	3.26	7.37	23.27	1.02
Wash-2	Site 1	976.99	proposed	24.00	2666.80	2667.44	2667.44	2667.64	0.024014	3.64	6.60	15.99	1.00
Wash-2	Site 1	871.07	proposed	24.00	2663.86	2664.61	2664.25	2664.64	0.002116	1.39	17.32	28.86	0.32
Wash-2	Site 1	800		Culvert									
Wash-2	Site 1	753.96	proposed	63.00	2660.00	2660.94	2660.82	2661.15	0.013219	3.68	17.10	25.89	0.80
Wash-2	Site 1	623.42	proposed	63.00	2657.95	2658.67	2658.67	2658.93	0.022596	4.04	15.58	30.83	1.00
Wash-2	Site 1	419.51	proposed	63.00	2651.88	2652.58	2652.58	2652.84	0.022894	4.09	15.41	30.30	1.01
Wash-2	Site 1	338.81	proposed	63.00	2649.25	2649.79	2649.79	2649.95	0.027918	3.20	19.70	65.07	1.02
Wash-2	Site 1	195.12	proposed	63.00	2644.43	2645.23	2645.13	2645.36	0.013018	2.92	21.60	46.18	0.75
Wash-2	Site 1	125.23	proposed	63.00	2643.33	2643.96	2643.95	2644.16	0.023610	3.50	18.00	45.78	0.98
Wash-2	Site 1	52.41	proposed	63.00	2641.70	2642.29	2642.28	2642.50	0.022000	3.61	17.44	40.11	0.97
Wash-1	Site 1	573.93	proposed	173.00	2675.95	2676.79		2676.89	0.005204	2.50	69.31	93.40	0.51
Wash-1	Site 1	441.09	proposed	173.00	2673.45	2674.48	2674.48	2674.79	0.021444	4.45	38.90	63.59	1.00
Wash-1	Site 1	349.35	proposed	173.00	2669.96	2670.96	2670.96	2671.32	0.020205	4.78	36.20	51.31	1.00
Wash-1	Site 1	232.03	proposed	199.00	2665.96	2667.06	2667.06	2667.46	0.019721	5.05	39.42	50.48	1.01
Wash-1	Site 1	153.28	proposed	199.00	2663.79	2664.69	2664.69	2665.03	0.020918	4.63	42.94	65.42	1.01
Wash-1	Site 1	12.67	proposed	199.00	2659.03	2660.30	2660.30	2660.70	0.019667	5.10	39.02	49.12	1.01

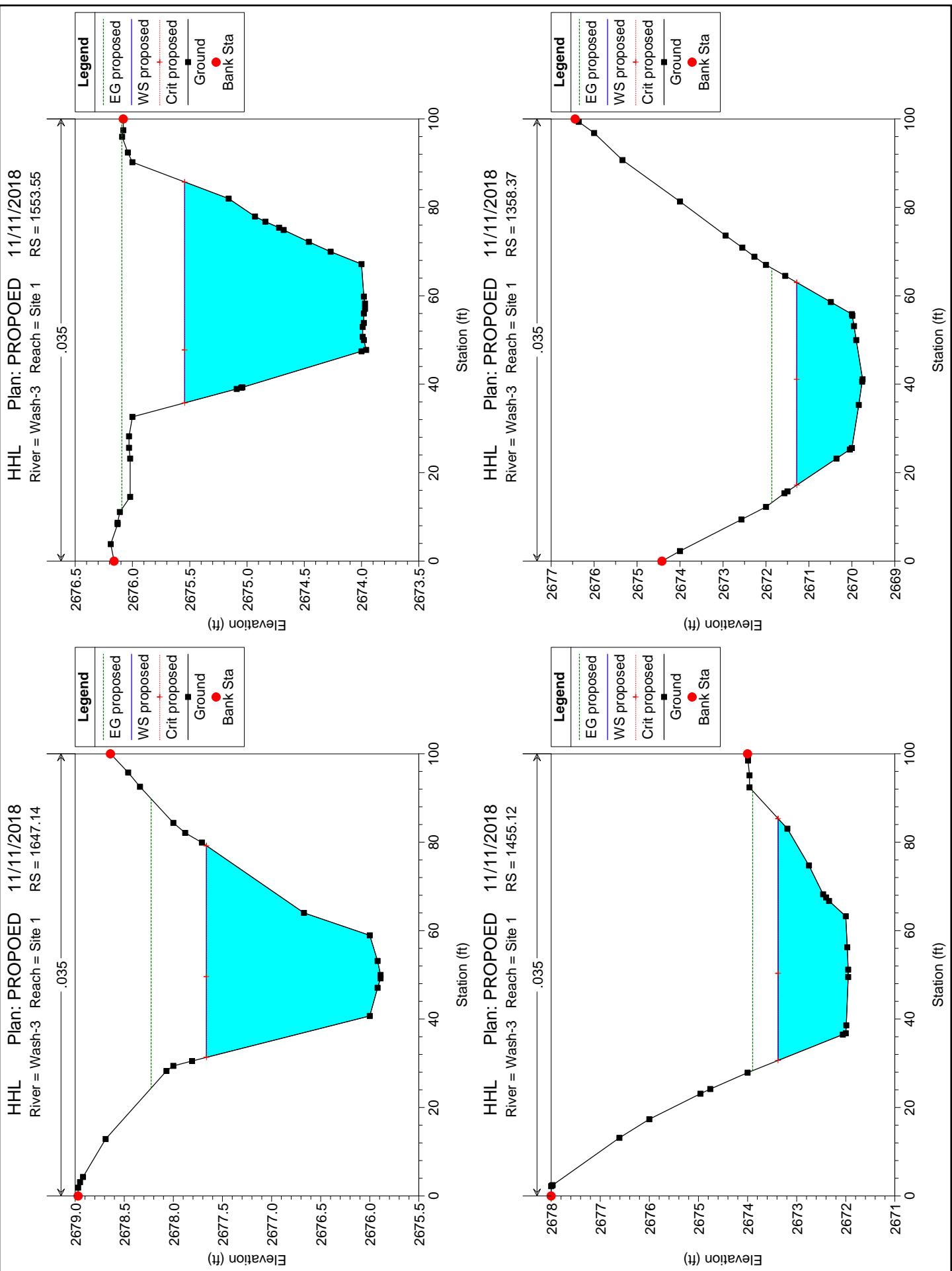


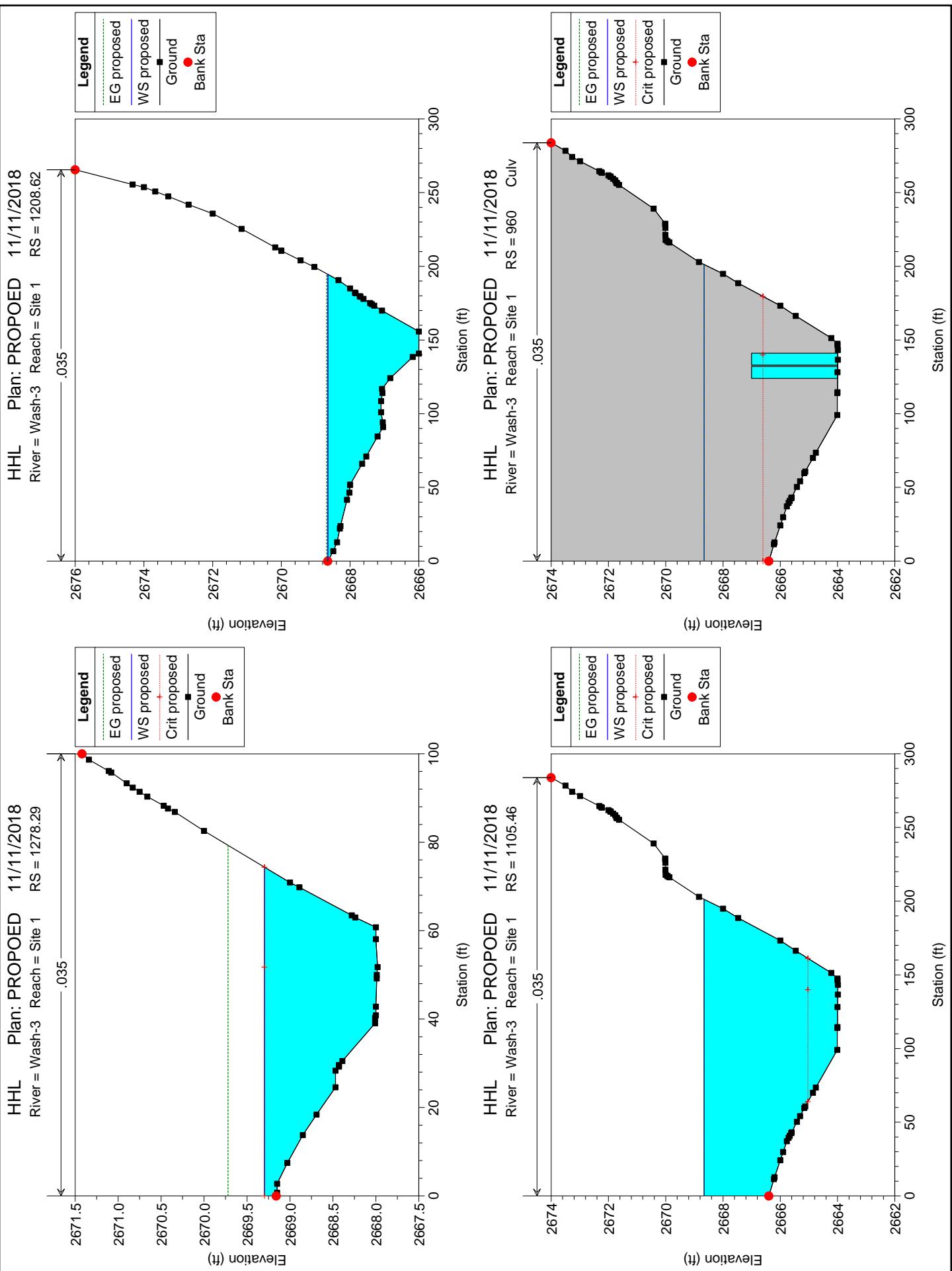


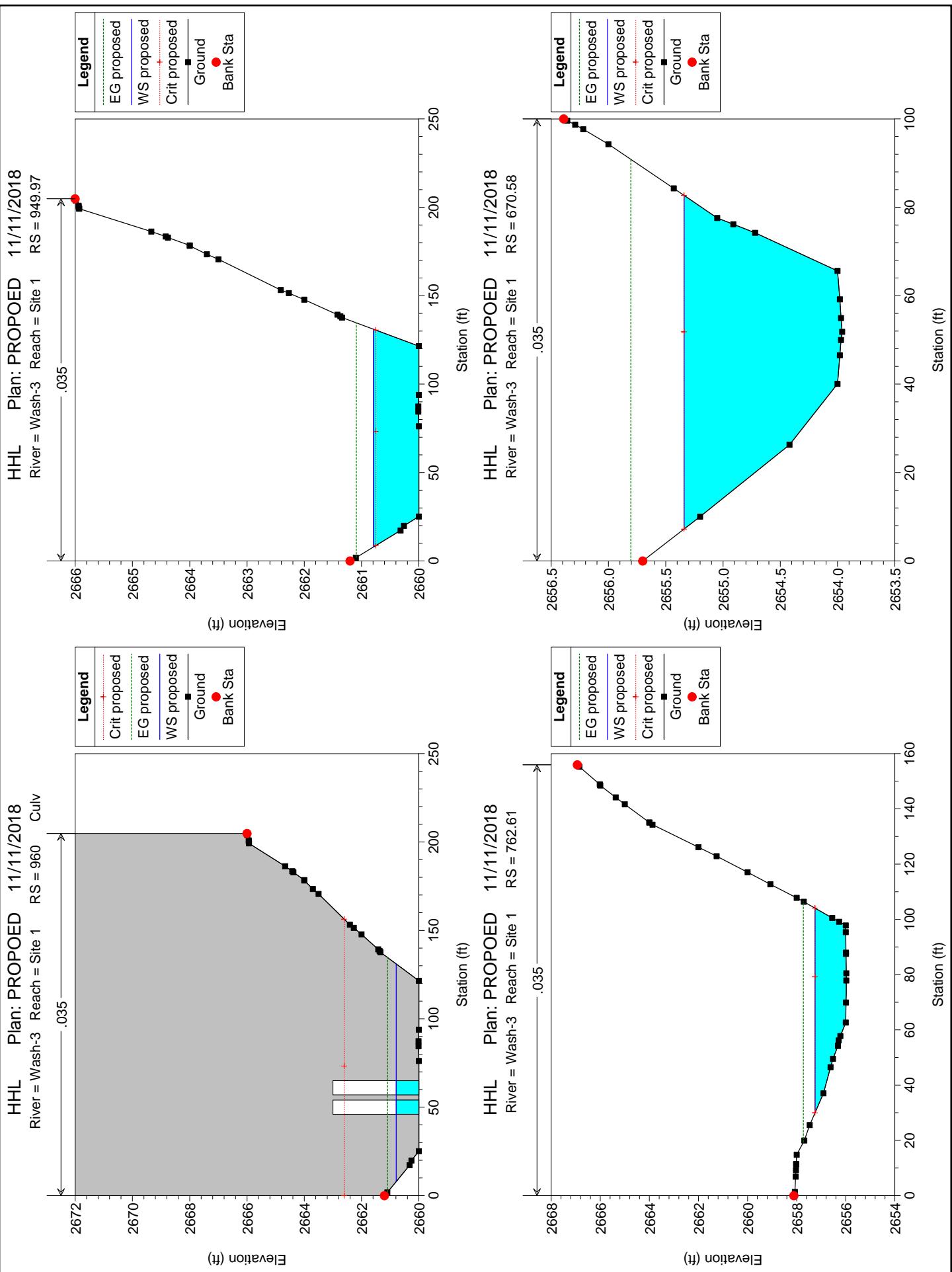


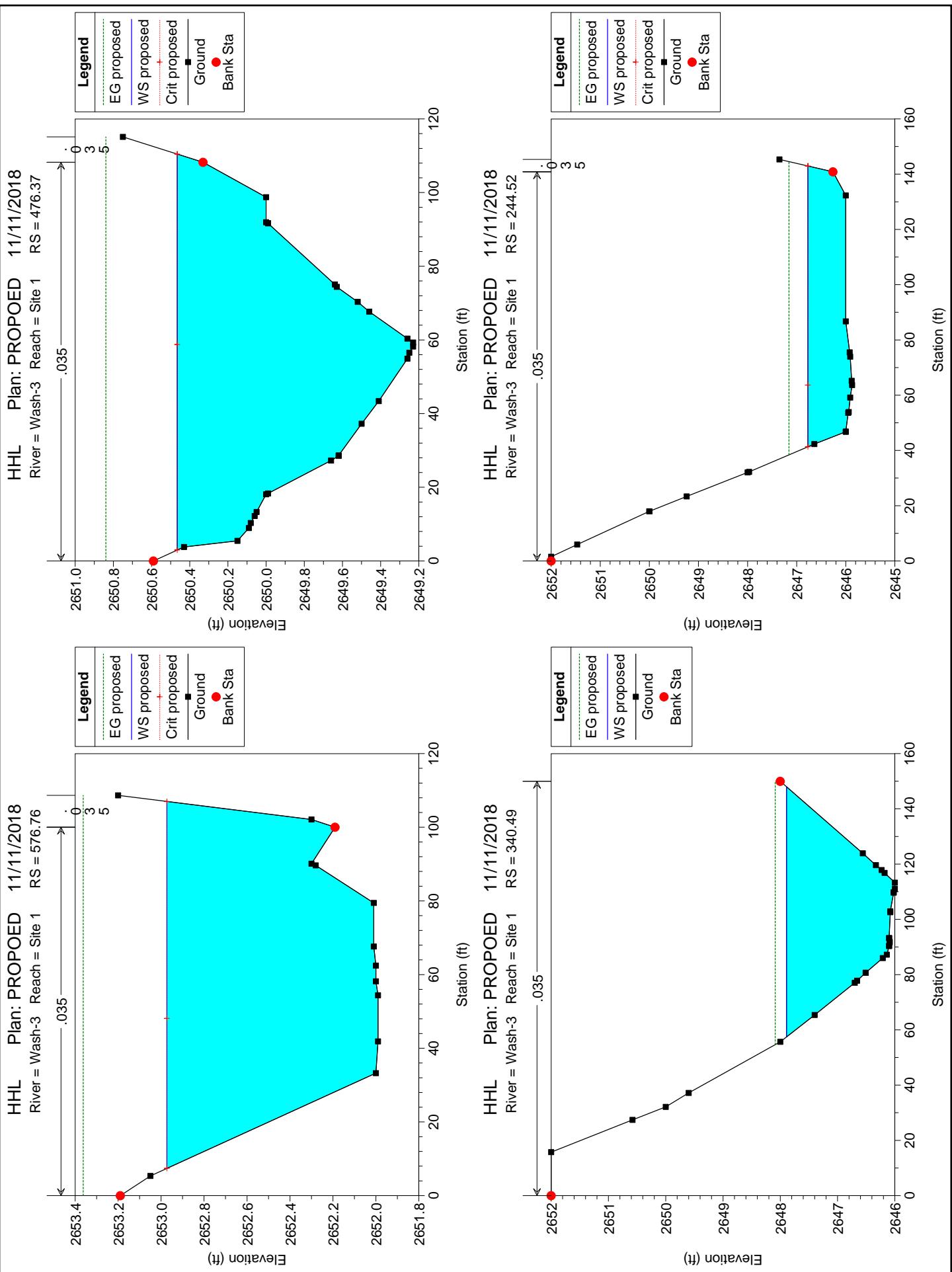


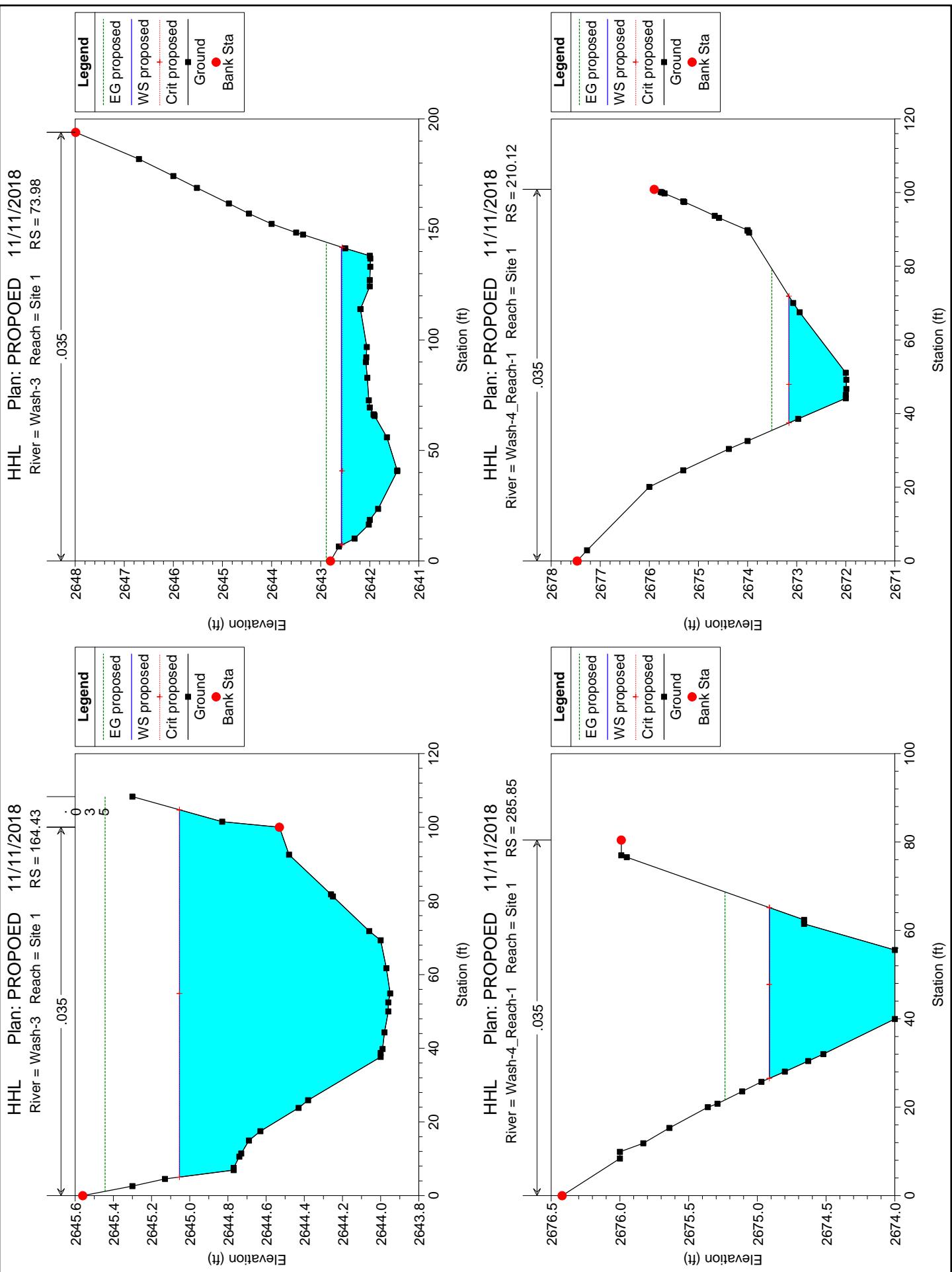


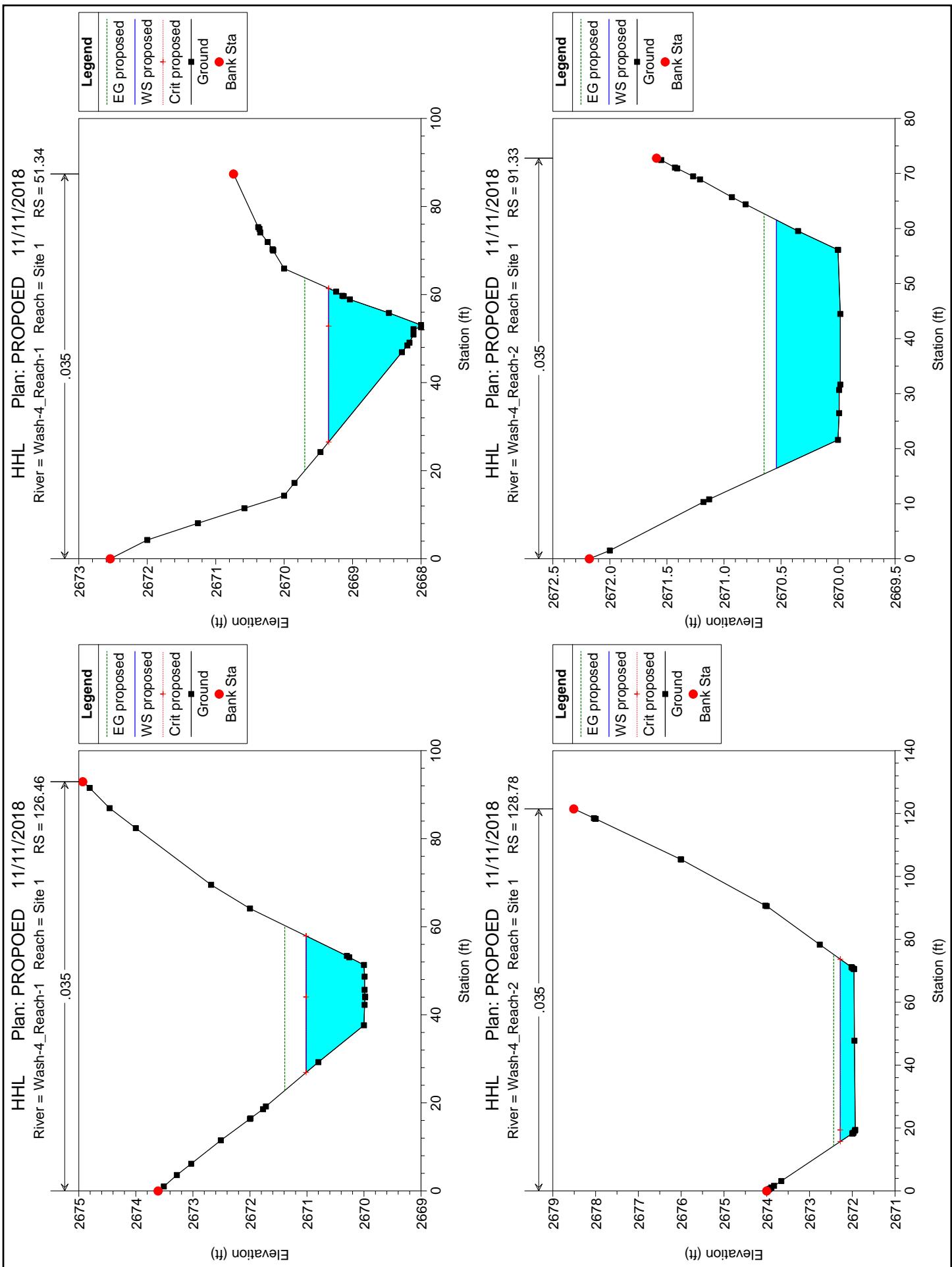


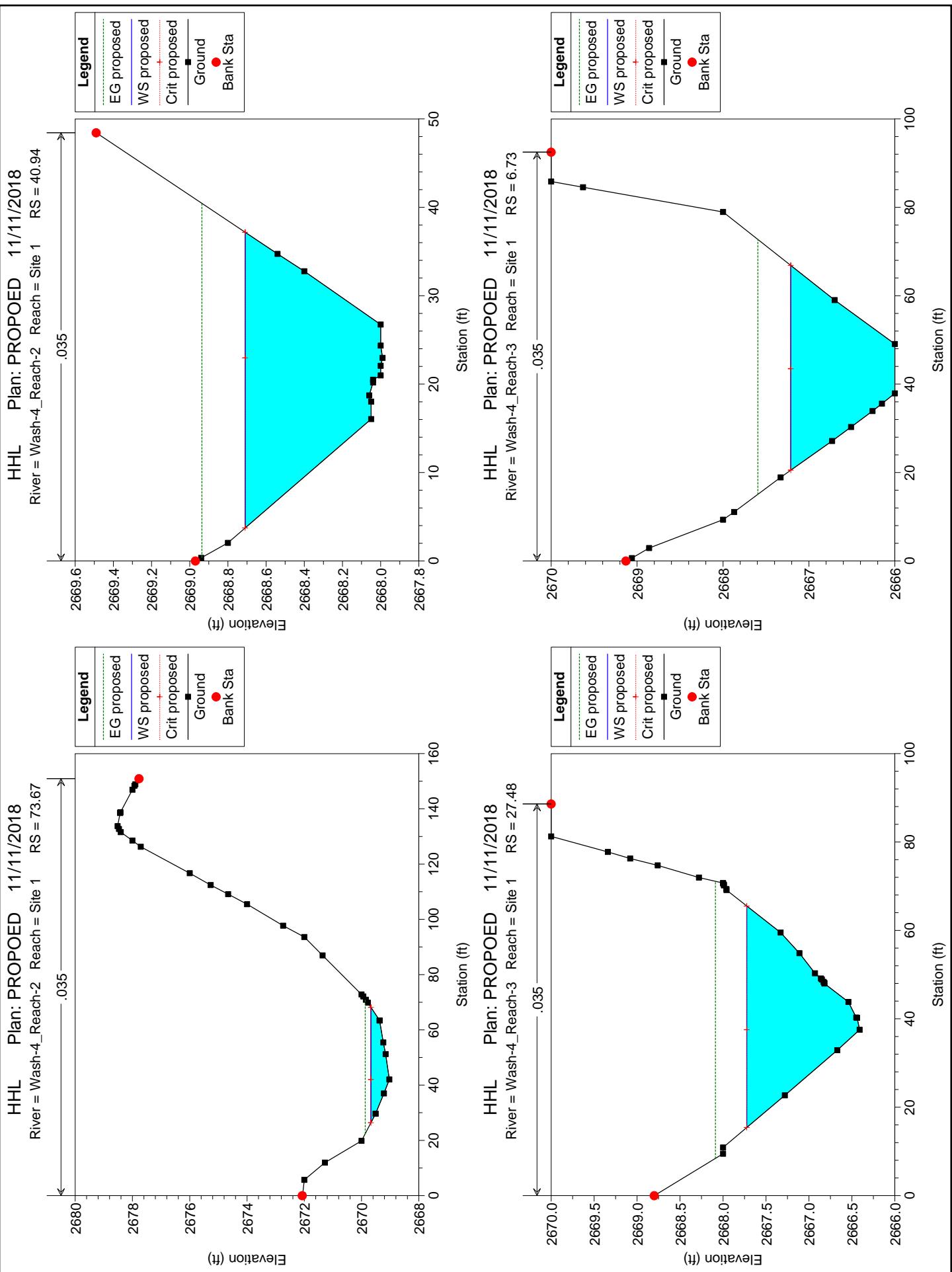












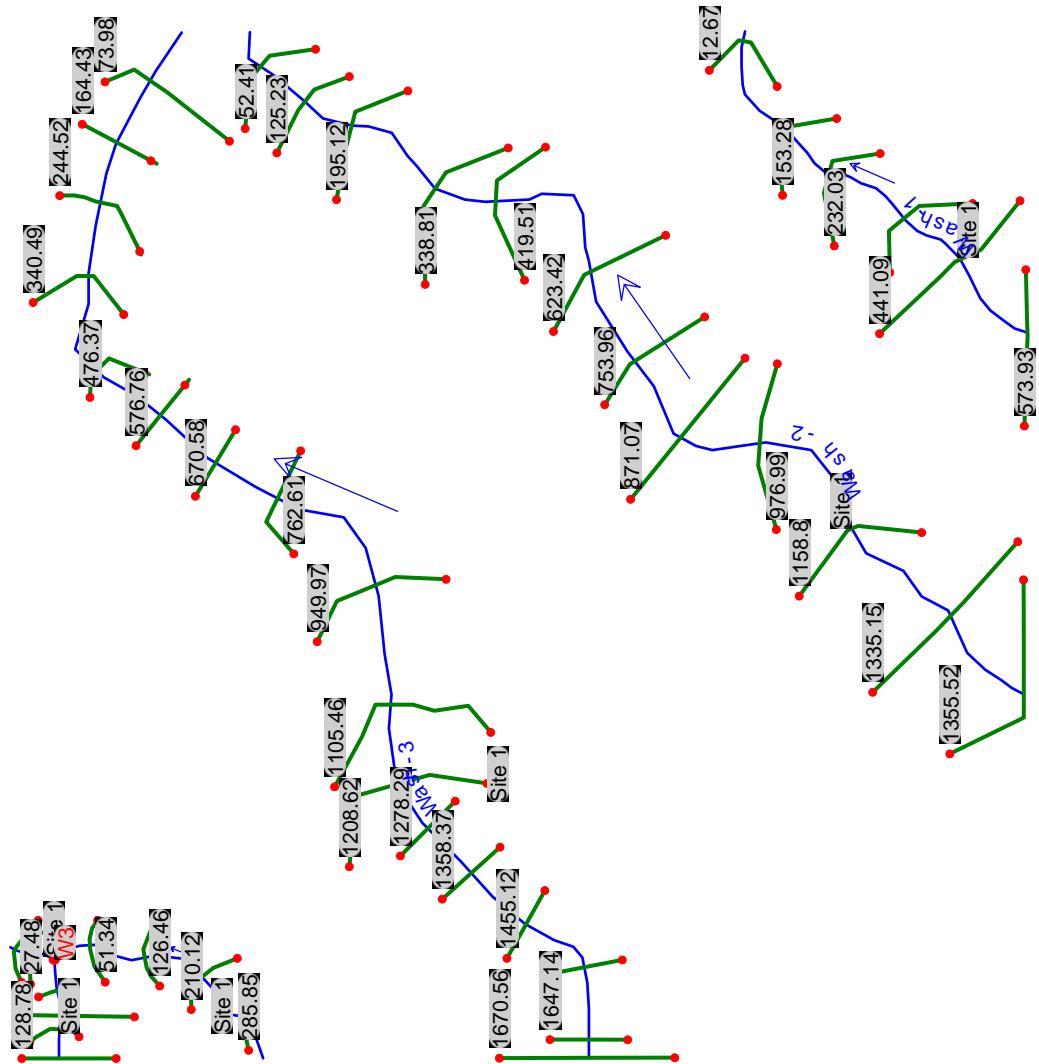
Existing HEC-RAS Model

*8280 E. Gelding Dr., Suite 101
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APPENDIX

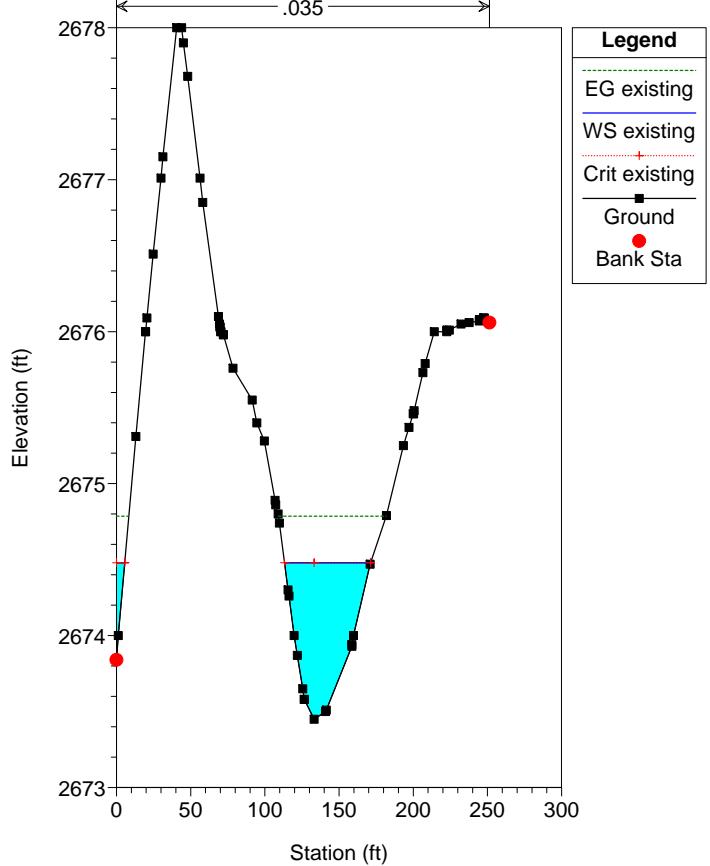


HEC-RAS Plan: EXISTING Profile: existing

River	Reach	River Sta	Profile	Q Total (cfs)	Min Ch El (ft)	W.S. Elev (ft)	Crit W.S. (ft)	E.G. Elev (ft)	E.G. Slope (ft/ft)	Vel Chnl (ft/s)	Flow Area (sq ft)	Top Width (ft)	Froude # Chl
Wash-4_Reach-3	Site 1	27.48	existing	176.00	2666.41	2667.73	2667.73	2668.10	0.020403	4.86	36.22	50.42	1.01
Wash-4_Reach-3	Site 1	6.73	existing	176.00	2666.00	2667.22	2667.22	2667.61	0.019924	4.98	35.36	46.63	1.01
Wash-4_Reach-2	Site 1	128.78	existing	58.00	2671.93	2672.28	2672.28	2672.44	0.025919	3.17	18.31	57.97	0.99
Wash-4_Reach-2	Site 1	91.33	existing	58.00	2669.98	2670.54		2670.65	0.010179	2.65	21.92	45.11	0.67
Wash-4_Reach-2	Site 1	73.67	existing	58.00	2669.03	2669.67	2669.67	2669.87	0.025146	3.58	16.20	41.75	1.01
Wash-4_Reach-2	Site 1	40.94	existing	58.00	2667.99	2668.71	2668.71	2668.94	0.023259	3.82	15.18	33.45	1.00
Wash-4_Reach-1	Site 1	285.85	existing	112.00	2674.00	2674.91	2674.91	2675.24	0.021209	4.56	24.54	38.63	1.01
Wash-4_Reach-1	Site 1	210.12	existing	112.00	2671.99	2673.16	2673.16	2673.51	0.020578	4.73	23.66	34.40	1.01
Wash-4_Reach-1	Site 1	126.46	existing	112.00	2669.98	2671.01	2671.01	2671.39	0.020309	4.92	22.79	30.99	1.01
Wash-4_Reach-1	Site 1	51.34	existing	112.00	2668.00	2669.35	2669.35	2669.70	0.021048	4.74	23.65	34.90	1.01
Wash-3	Site 1	1670.56	existing	322.00	2676.00	2678.04	2678.04	2678.71	0.016428	6.58	48.91	36.38	1.00
Wash-3	Site 1	1647.14	existing	322.00	2675.89	2677.66	2677.66	2678.23	0.017445	6.02	53.50	47.88	1.00
Wash-3	Site 1	1553.55	existing	322.00	2673.96	2675.55	2675.55	2676.09	0.017571	5.93	54.29	50.00	1.00
Wash-3	Site 1	1455.12	existing	322.00	2671.95	2673.38	2673.38	2673.90	0.018154	5.78	55.72	54.68	1.01
Wash-3	Site 1	1358.37	existing	322.00	2669.75	2671.28	2671.28	2671.86	0.017386	6.12	52.61	45.81	1.01
Wash-3	Site 1	1278.29	existing	322.00	2667.98	2669.30	2669.30	2669.72	0.019477	5.22	61.68	74.36	1.01
Wash-3	Site 1	1208.62	existing	411.00	2666.00	2667.57	2667.57	2667.96	0.020257	5.02	81.89	108.07	1.02
Wash-3	Site 1	1105.46	existing	411.00	2663.99	2665.08	2665.08	2665.49	0.019359	5.12	80.27	99.41	1.00
Wash-3	Site 1	949.97	existing	411.00	2660.00	2660.82	2660.79	2661.14	0.017144	4.52	91.00	124.19	0.93
Wash-3	Site 1	762.61	existing	411.00	2655.98	2657.31	2657.31	2657.80	0.018318	5.62	73.12	75.43	1.01
Wash-3	Site 1	670.58	existing	411.00	2653.96	2655.39	2655.39	2655.87	0.018292	5.56	73.92	77.48	1.00
Wash-3	Site 1	576.76	existing	411.00	2651.99	2653.02	2653.02	2653.42	0.018983	5.15	80.90	101.02	1.00
Wash-3	Site 1	476.37	existing	411.00	2649.23	2650.51	2650.51	2650.90	0.019443	4.99	82.56	109.22	1.00
Wash-3	Site 1	340.49	existing	411.00	2646.00	2647.95		2648.15	0.005748	3.66	112.25	92.42	0.59
Wash-3	Site 1	244.52	existing	411.00	2645.87	2646.81	2646.81	2647.21	0.019197	5.09	81.07	102.13	1.00
Wash-3	Site 1	164.43	existing	411.00	2643.95	2645.09	2645.09	2645.50	0.018640	5.14	80.65	100.54	0.99
Wash-3	Site 1	73.98	existing	411.00	2641.44	2642.61	2642.59	2642.93	0.020033	4.57	89.90	135.39	0.99
Wash-2	Site 1	1355.52	existing	24.00	2687.97	2688.18	2688.18	2688.28	0.031048	2.50	9.61	49.80	1.00
Wash-2	Site 1	1335.15	existing	24.00	2681.48	2681.99	2681.99	2682.11	0.029864	2.75	8.74	38.11	1.01
Wash-2	Site 1	1158.8	existing	24.00	2673.50	2674.11	2674.11	2674.28	0.027329	3.26	7.37	23.27	1.02
Wash-2	Site 1	976.99	existing	24.00	2666.80	2667.44	2667.44	2667.64	0.024014	3.64	6.60	15.99	1.00
Wash-2	Site 1	871.07	existing	24.00	2663.86	2664.25	2664.25	2664.41	0.026618	3.14	7.64	24.94	1.00
Wash-2	Site 1	753.96	existing	71.00	2660.00	2660.99	2660.88	2661.22	0.013574	3.85	18.45	26.67	0.82
Wash-2	Site 1	623.42	existing	71.00	2657.95	2658.72	2658.72	2658.99	0.022062	4.14	17.13	32.09	1.00
Wash-2	Site 1	419.51	existing	71.00	2651.88	2652.63	2652.63	2652.90	0.022101	4.19	16.94	31.26	1.00
Wash-2	Site 1	338.81	existing	71.00	2649.25	2649.82	2649.82	2649.99	0.026403	3.28	21.67	66.20	1.01
Wash-2	Site 1	195.12	existing	71.00	2644.43	2645.27	2645.17	2645.41	0.013062	3.02	23.51	47.86	0.76
Wash-2	Site 1	125.23	existing	71.00	2643.33	2644.01	2644.00	2644.20	0.023645	3.56	19.94	49.49	0.99
Wash-2	Site 1	52.41	existing	71.00	2641.70	2642.33	2642.32	2642.55	0.021989	3.76	18.88	40.82	0.98
Wash-1	Site 1	573.93	existing	173.00	2675.95	2676.79		2676.89	0.005210	2.50	69.29	93.39	0.51
Wash-1	Site 1	441.09	existing	173.00	2673.45	2674.48	2674.48	2674.79	0.021377	4.44	38.95	63.63	1.00
Wash-1	Site 1	349.35	existing	173.00	2669.96	2670.96	2670.96	2671.32	0.020480	4.80	36.03	51.21	1.01
Wash-1	Site 1	232.03	existing	182.00	2665.96	2667.01	2667.01	2667.39	0.020002	4.95	36.79	49.10	1.01
Wash-1	Site 1	153.28	existing	182.00	2663.79	2664.65	2664.65	2664.97	0.020914	4.50	40.40	64.25	1.00
Wash-1	Site 1	12.67	existing	182.00	2659.03	2660.25	2660.25	2660.63	0.019610	4.98	36.55	47.59	1.00

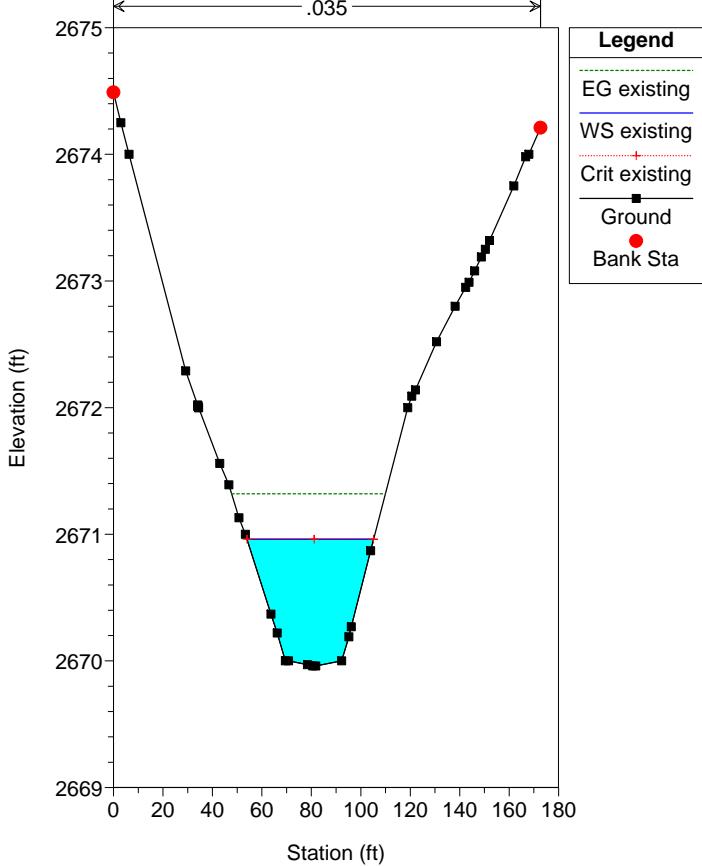
HHL Plan: EXISTING 11/11/2018

River = Wash-1 Reach = Site 1 RS = 441.09



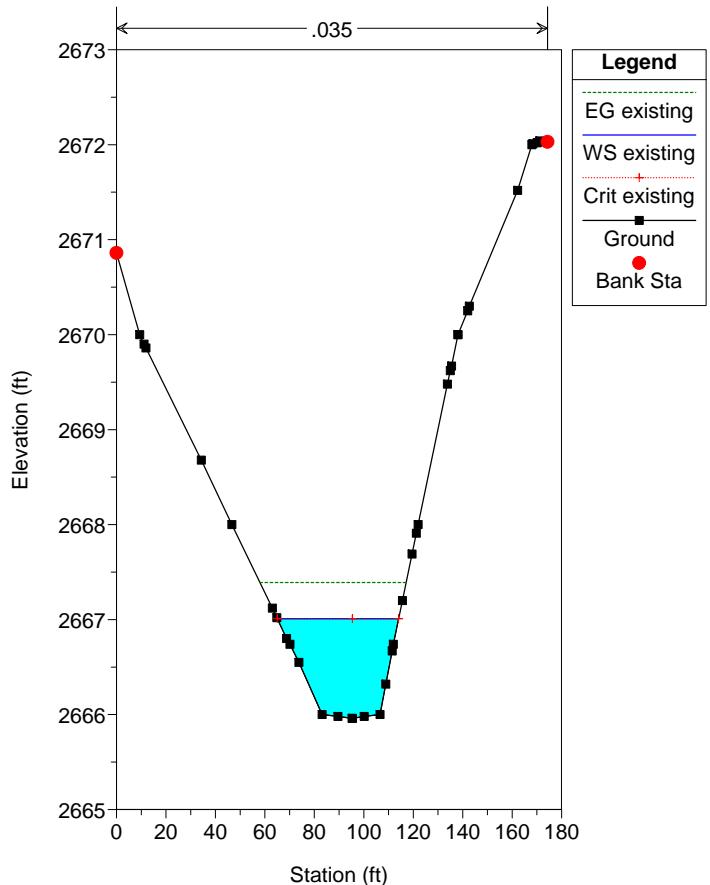
HHL Plan: EXISTING 11/11/2018

River = Wash-1 Reach = Site 1 RS = 349.35



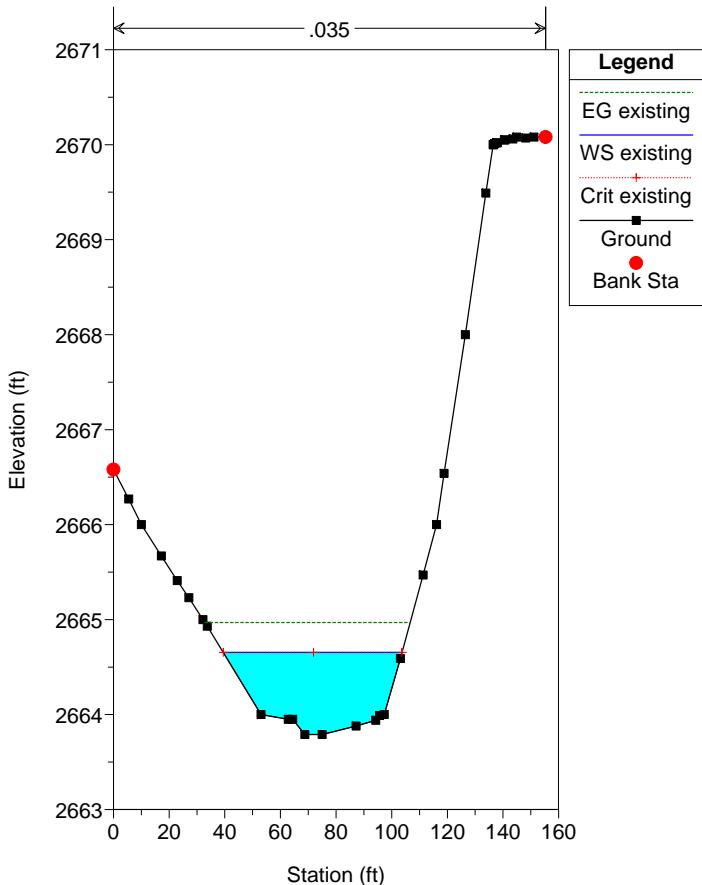
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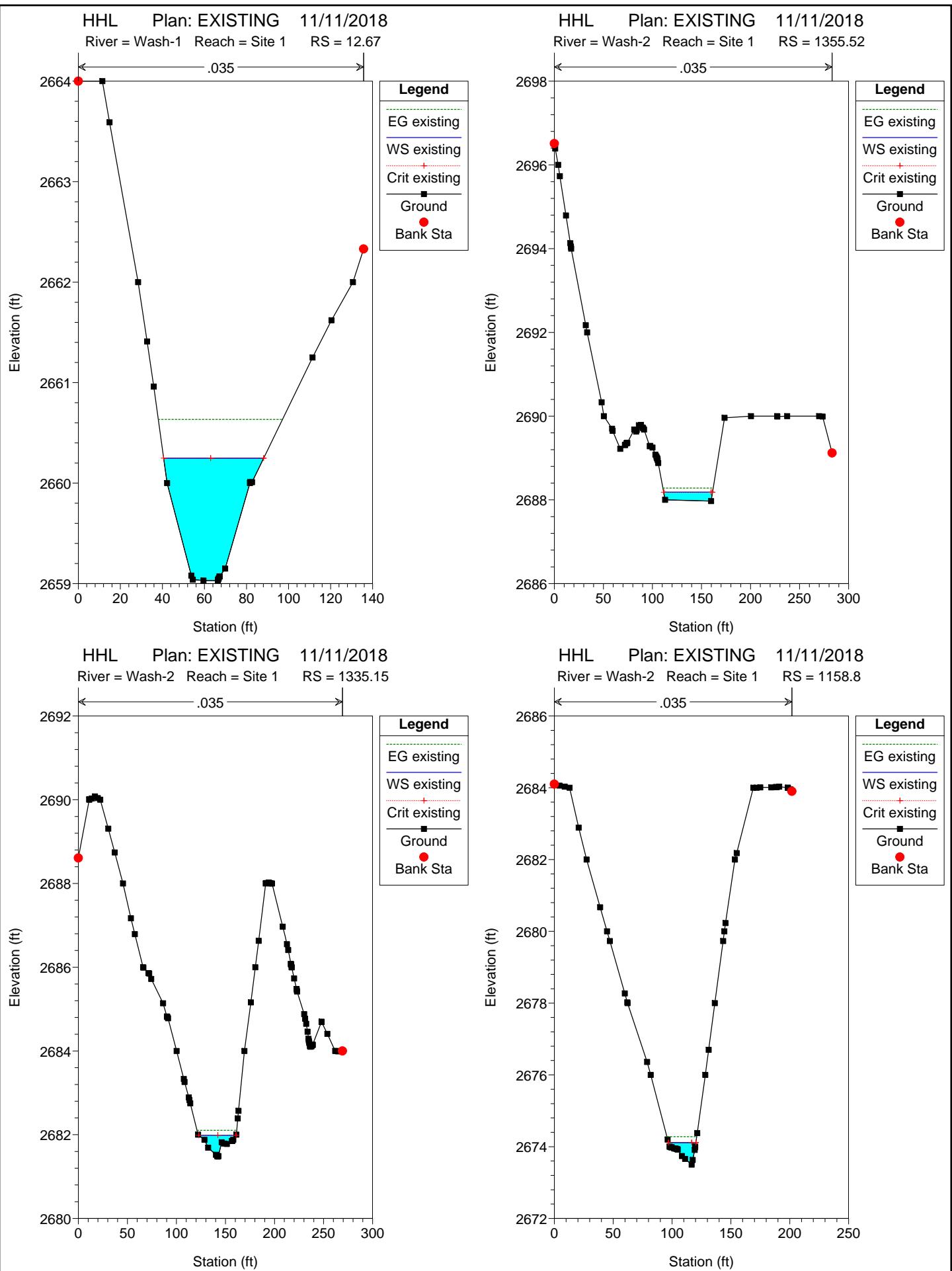
River = Wash-1 Reach = Site 1 RS = 232.03



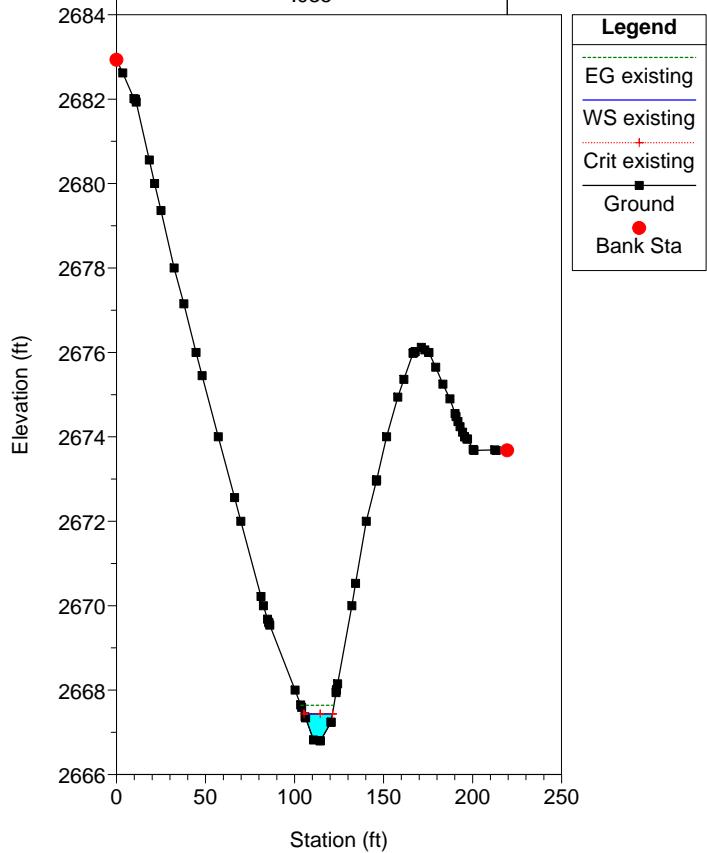
HHL Plan: EXISTING 11/11/2018

River = Wash-1 Reach = Site 1 RS = 153.28

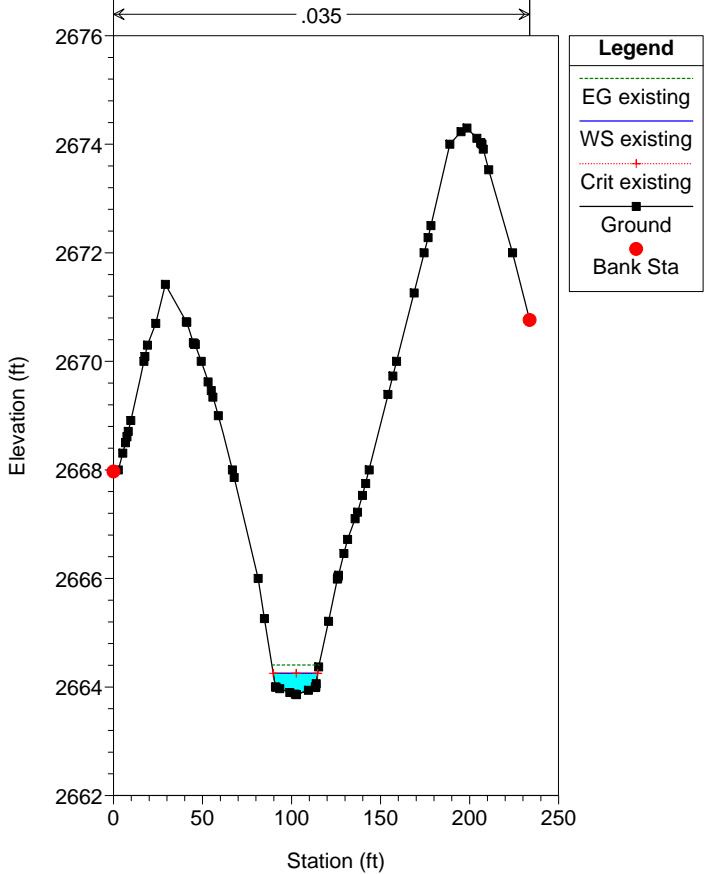




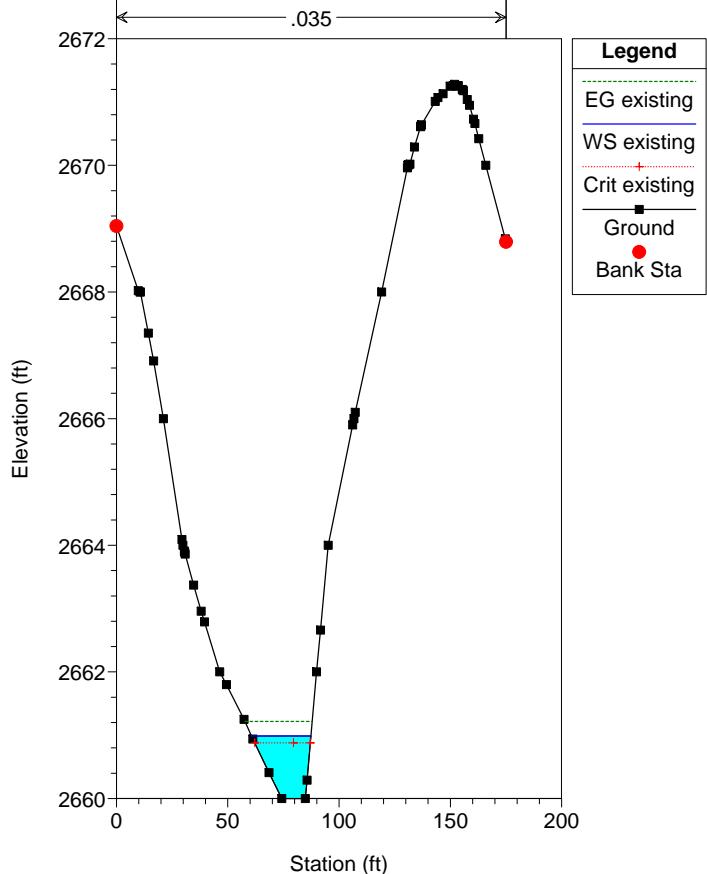
HHL Plan: EXISTING 11/11/2018
River = Wash-2 Reach = Site 1 RS = 976.99



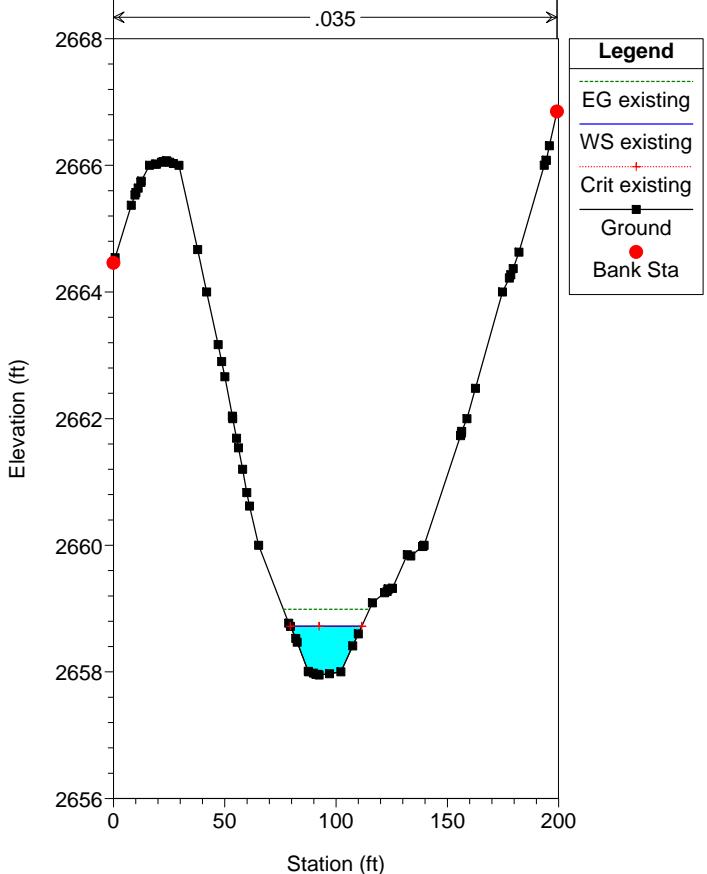
HHL Plan: EXISTING 11/11/2018
River = Wash-2 Reach = Site 1 RS = 871.07



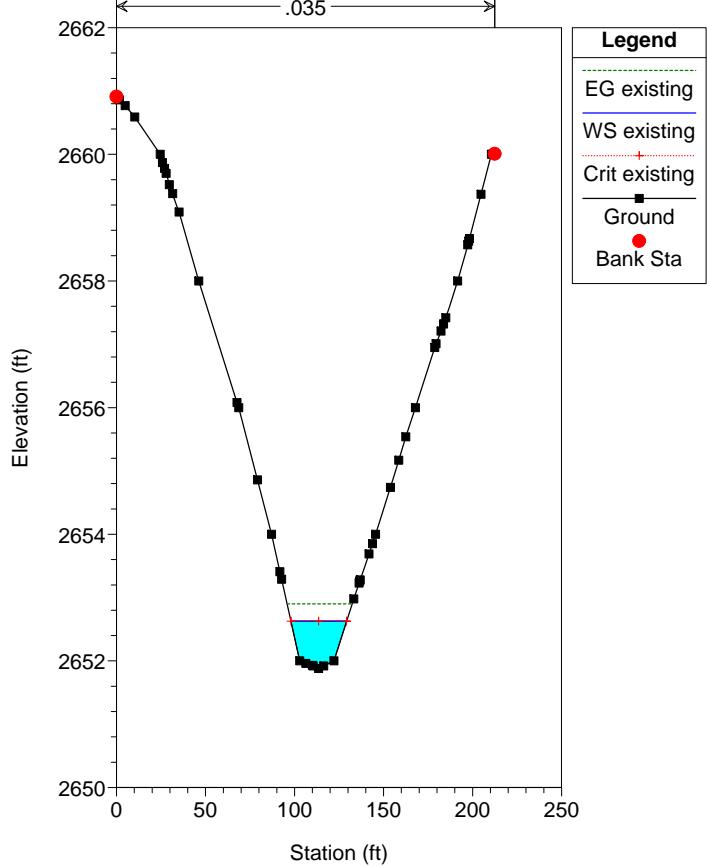
HHL Plan: EXISTING 11/11/2018
River = Wash-2 Reach = Site 1 RS = 753.96



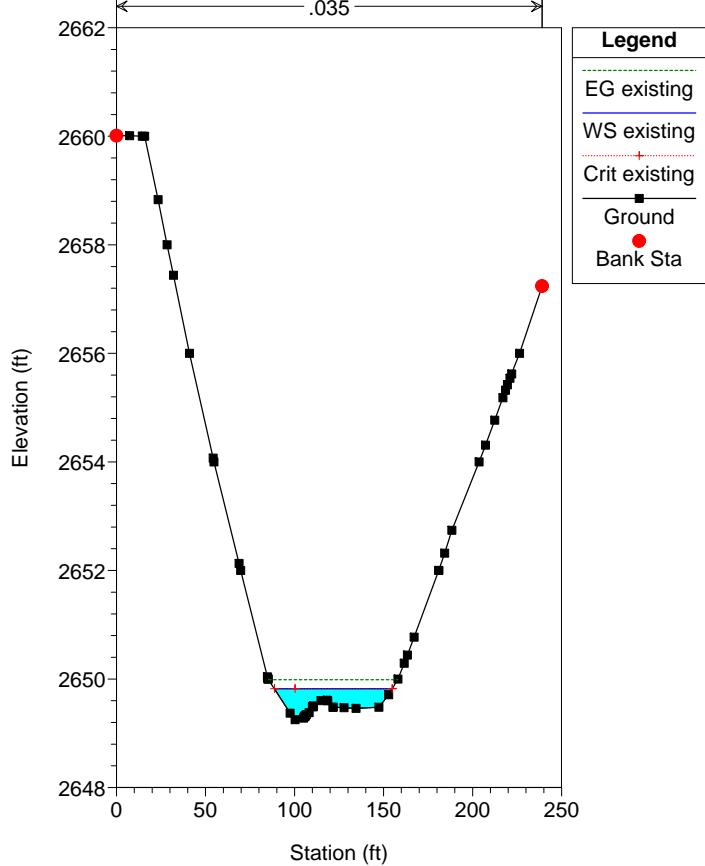
HHL Plan: EXISTING 11/11/2018
River = Wash-2 Reach = Site 1 RS = 623.42



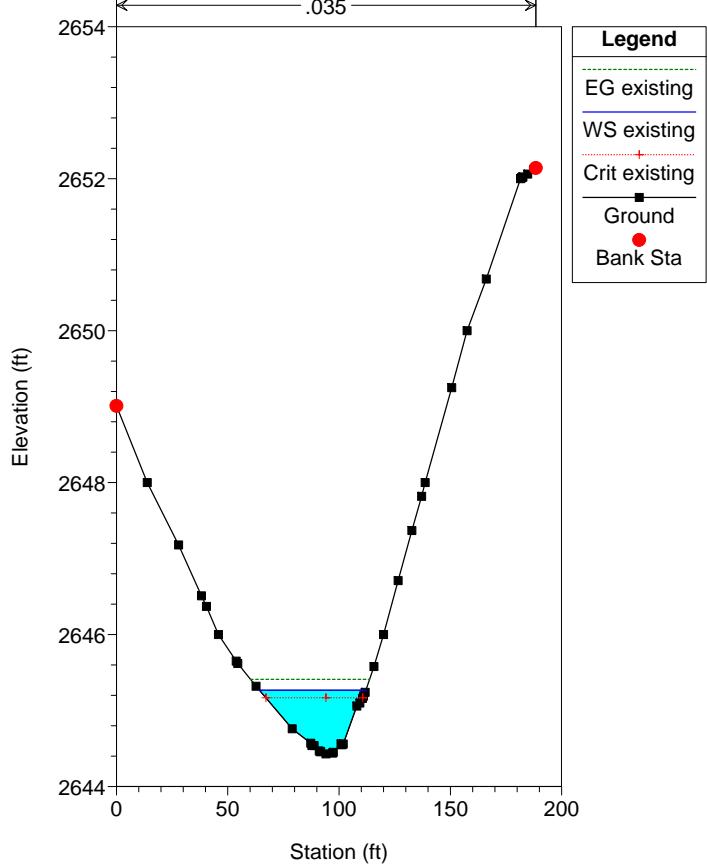
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River = Wash-2 Reach = Site 1 RS = 419.51



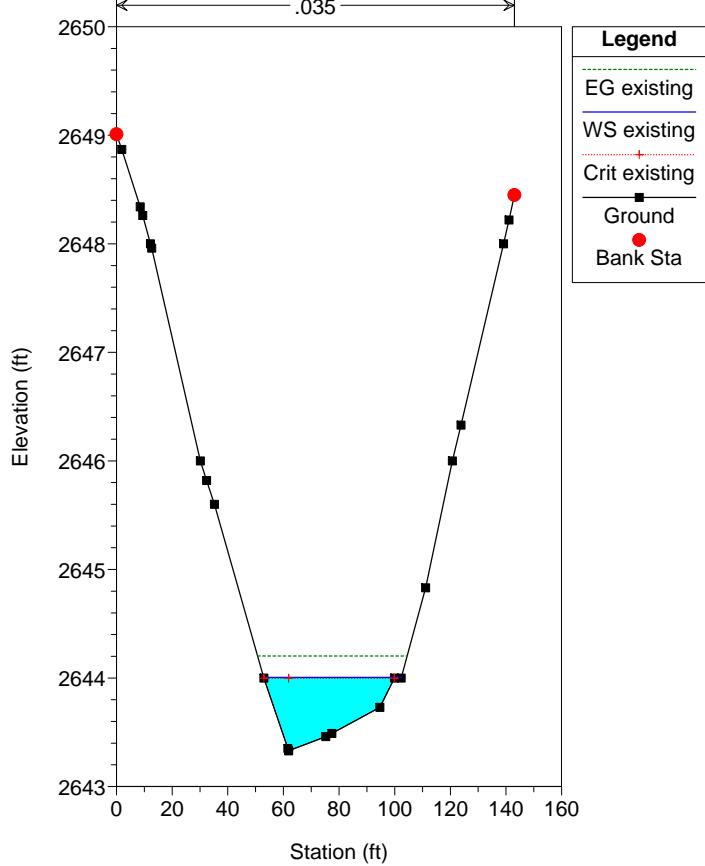
HHL Plan: EXISTING 11/11/2018
River = Wash-2 Reach = Site 1 RS = 338.81



HHL Plan: EXISTING 11/11/2018
River = Wash-2 Reach = Site 1 RS = 195.12

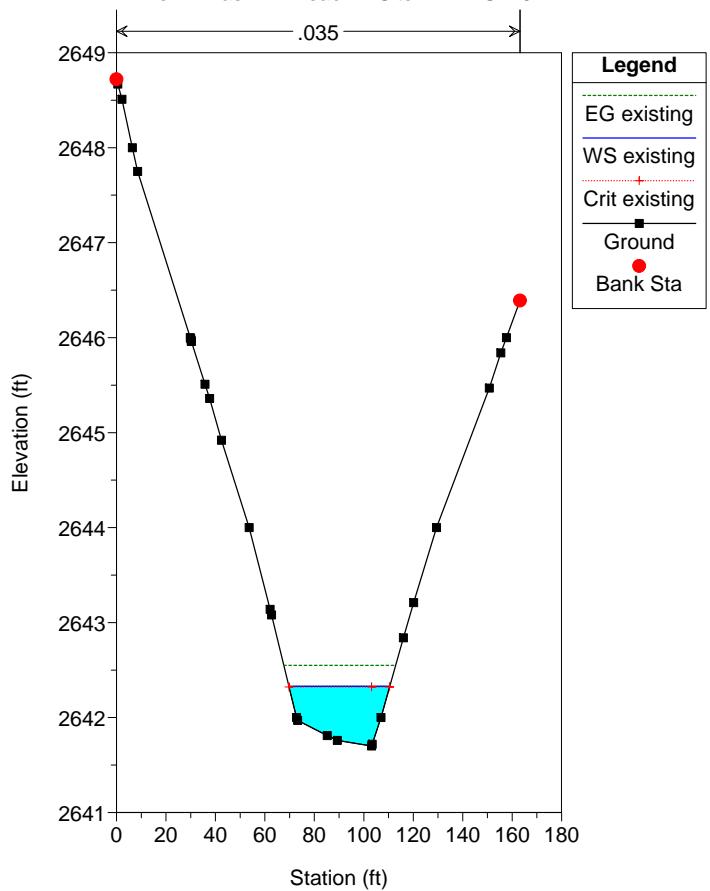


HHL Plan: EXISTING 11/11/2018
River = Wash-2 Reach = Site 1 RS = 125.23



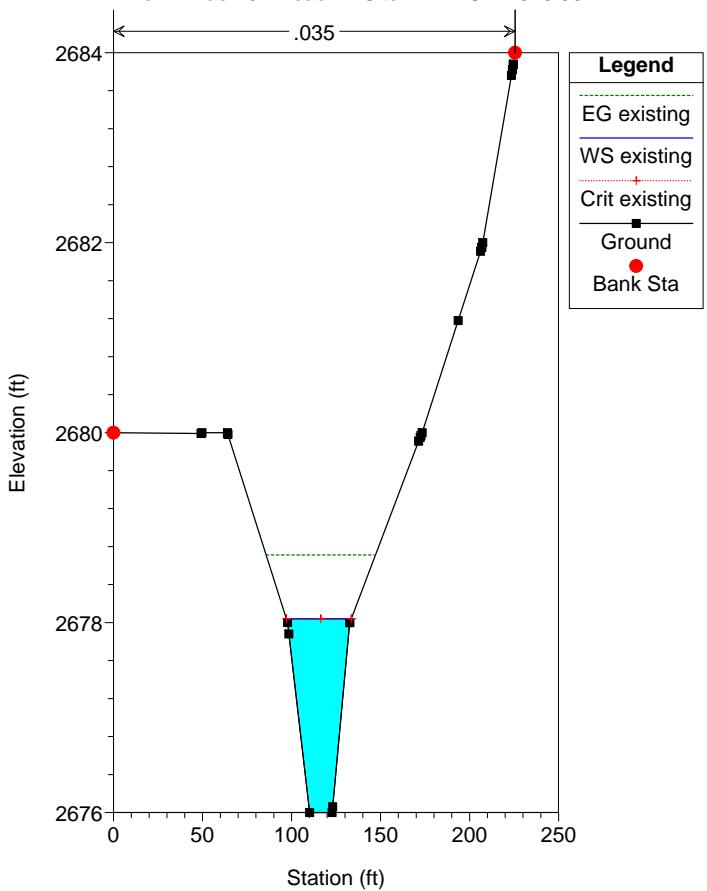
HHL Plan: EXISTING 11/11/2018

River = Wash-2 Reach = Site 1 RS = 52.41



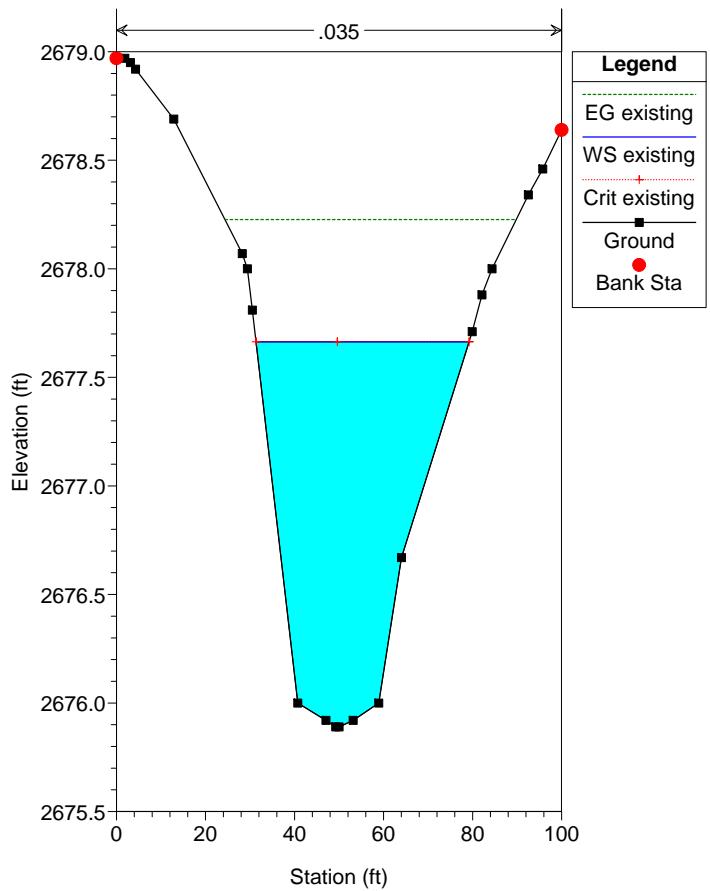
HHL Plan: EXISTING 11/11/2018

River = Wash-3 Reach = Site 1 RS = 1670.56



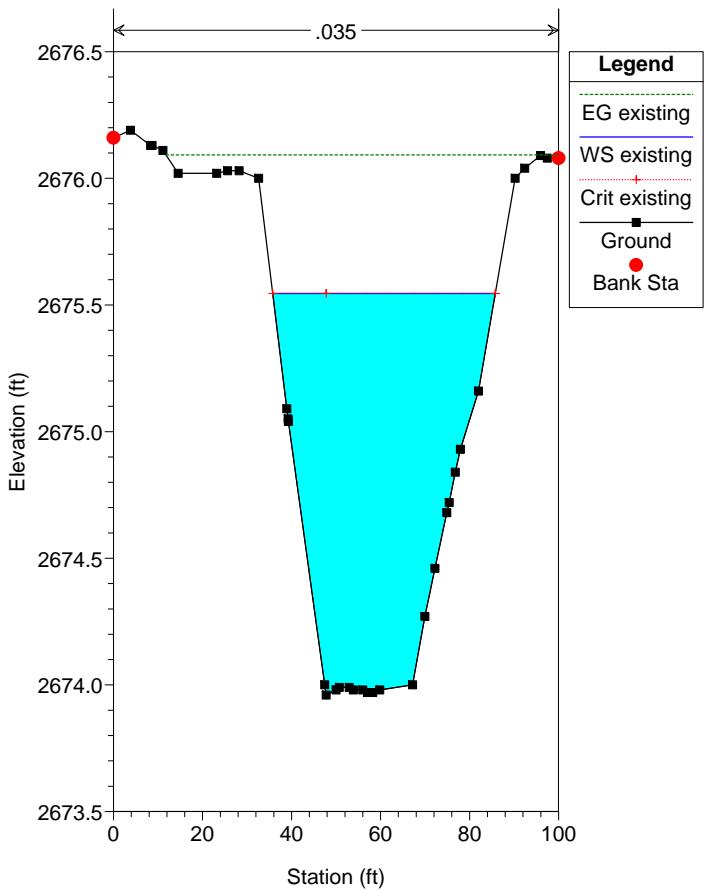
HHL Plan: EXISTING 11/11/2018

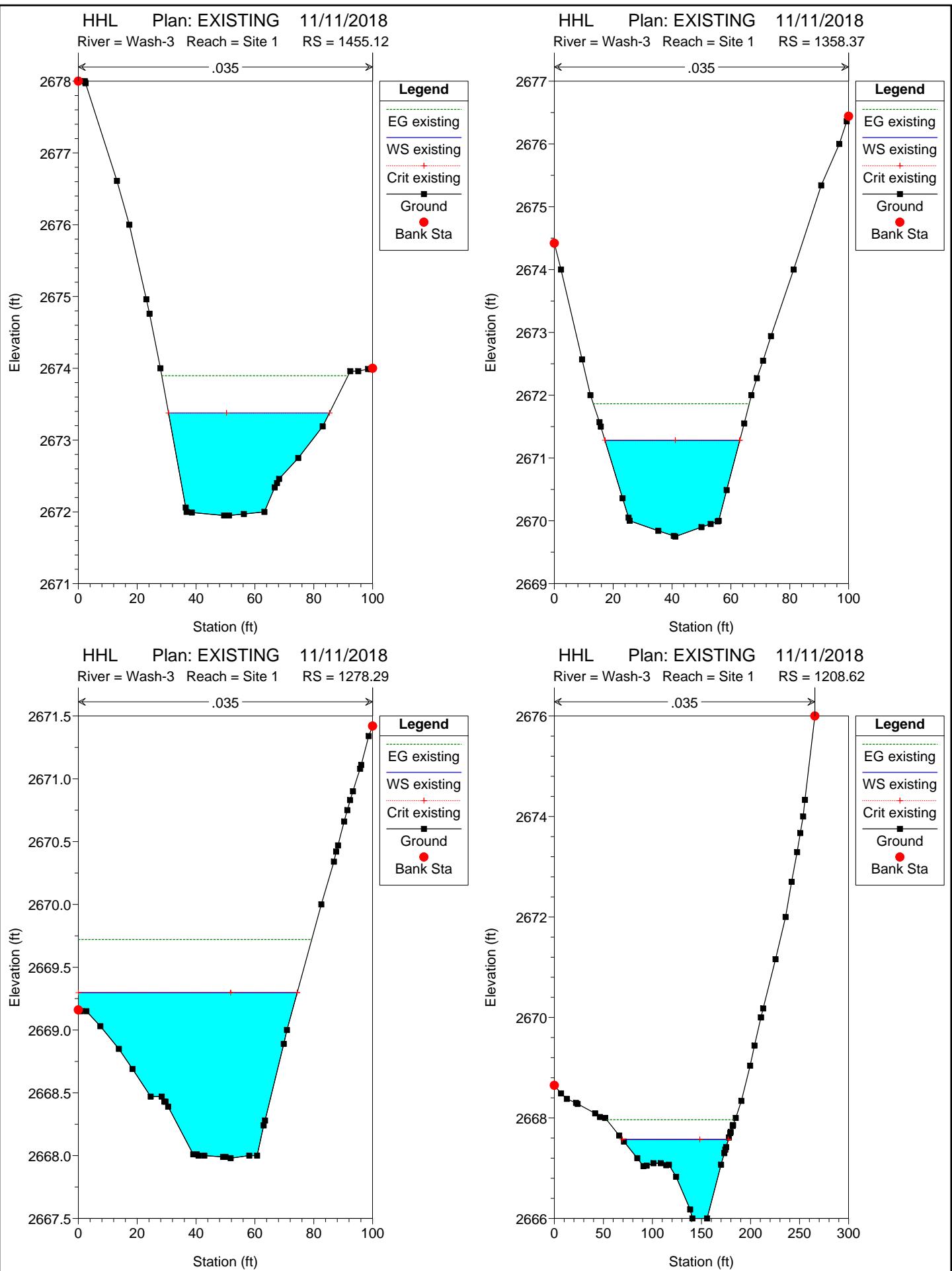
River = Wash-3 Reach = Site 1 RS = 1647.14

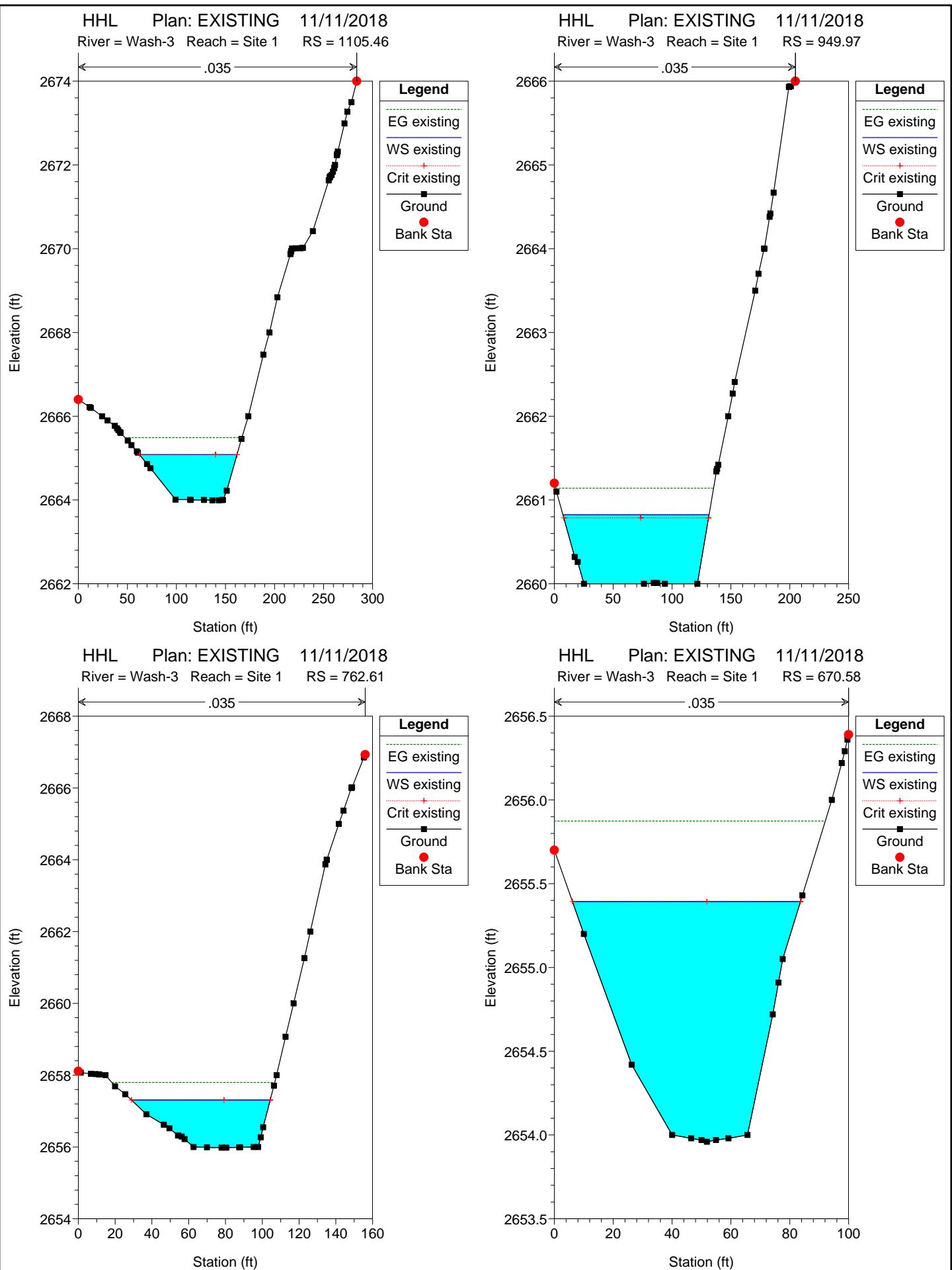


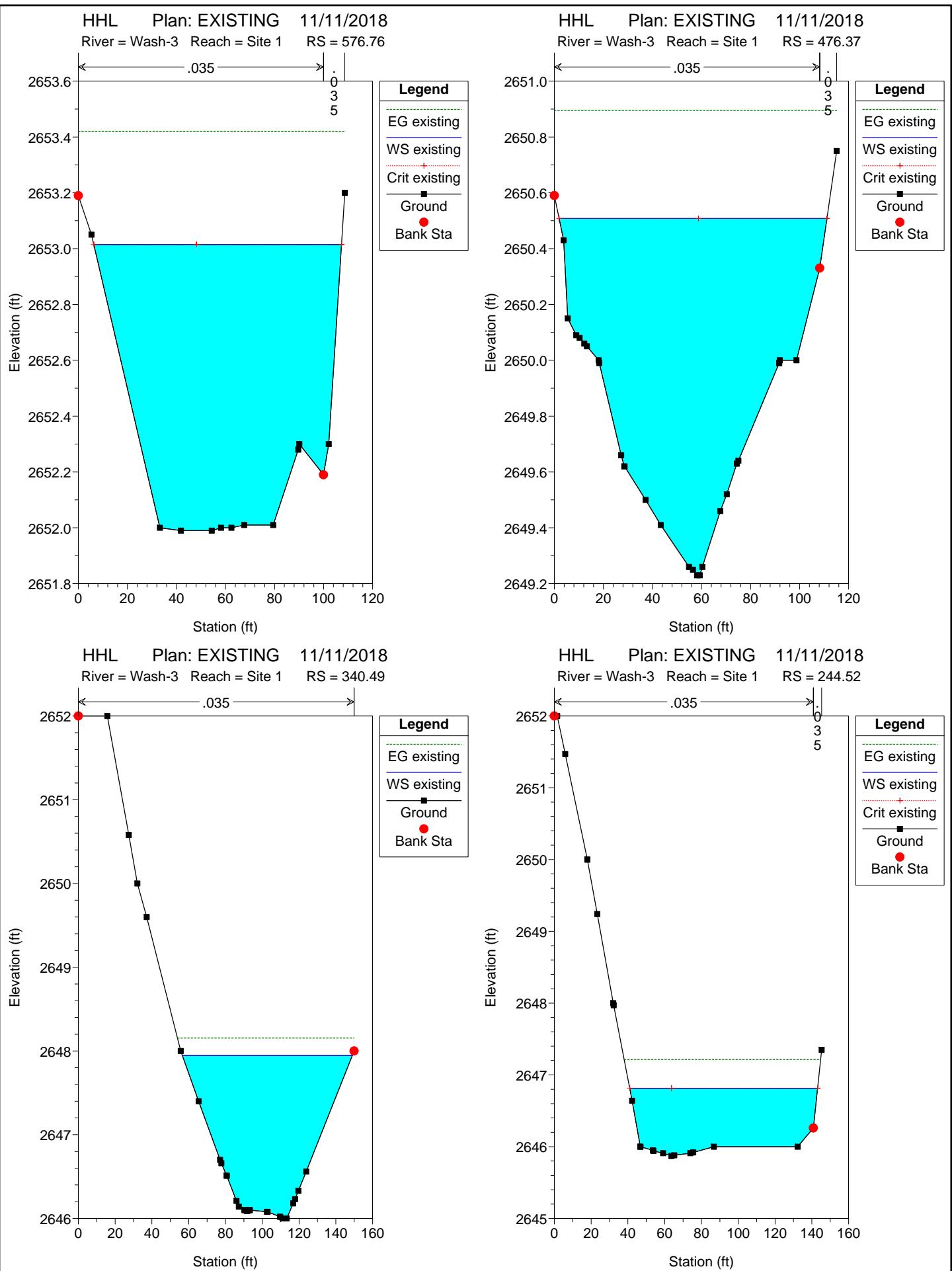
HHL Plan: EXISTING 11/11/2018

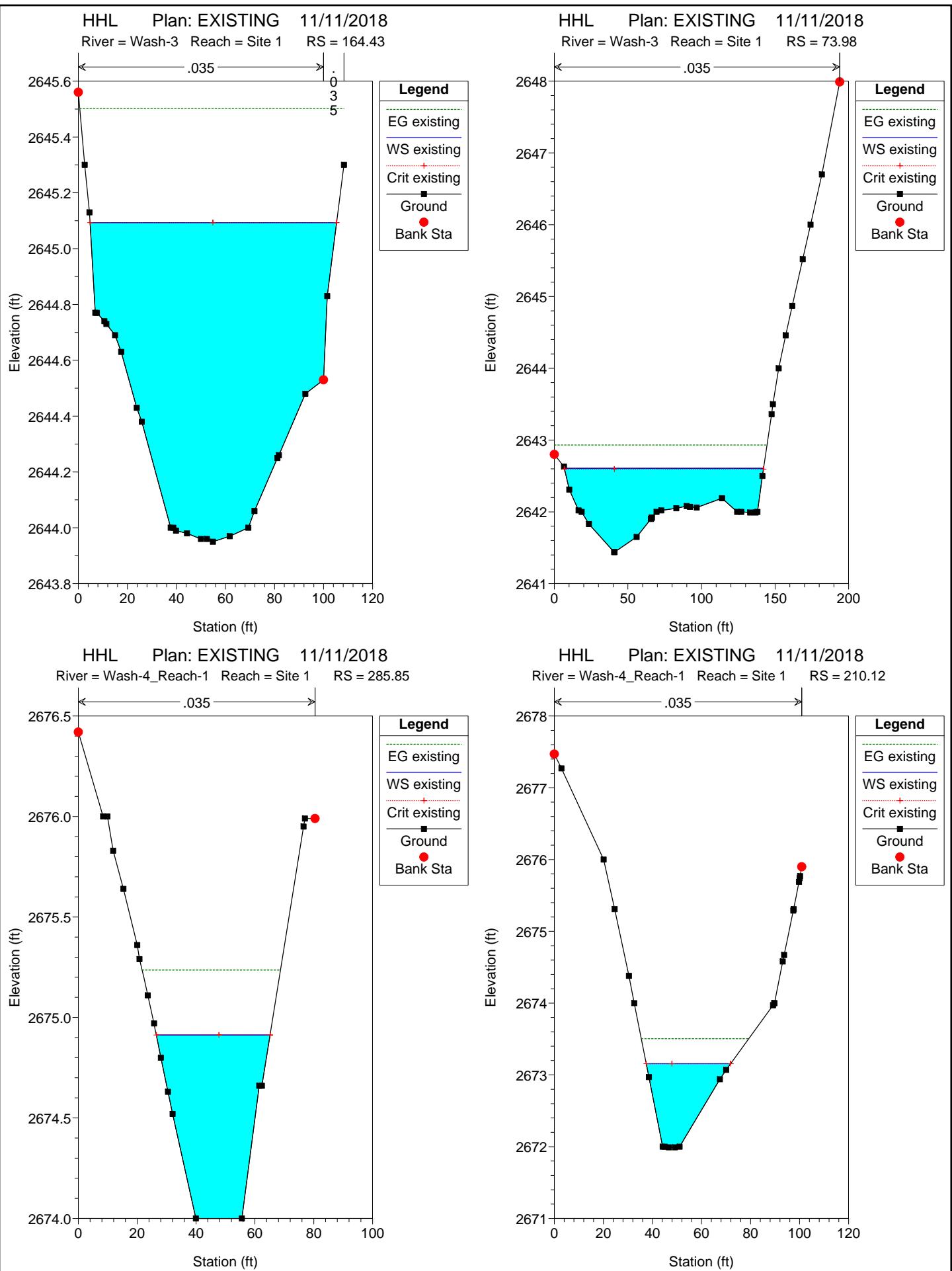
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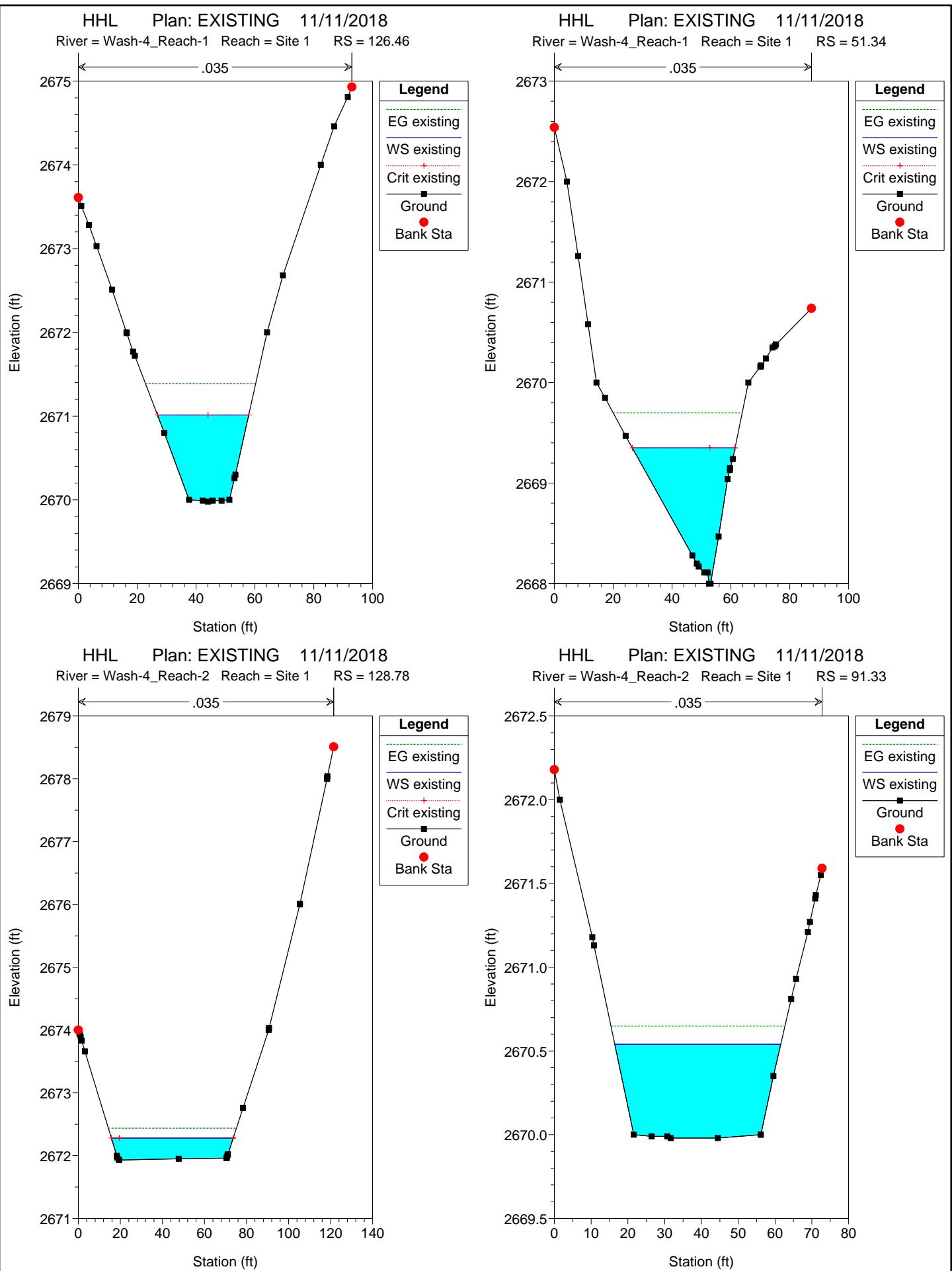


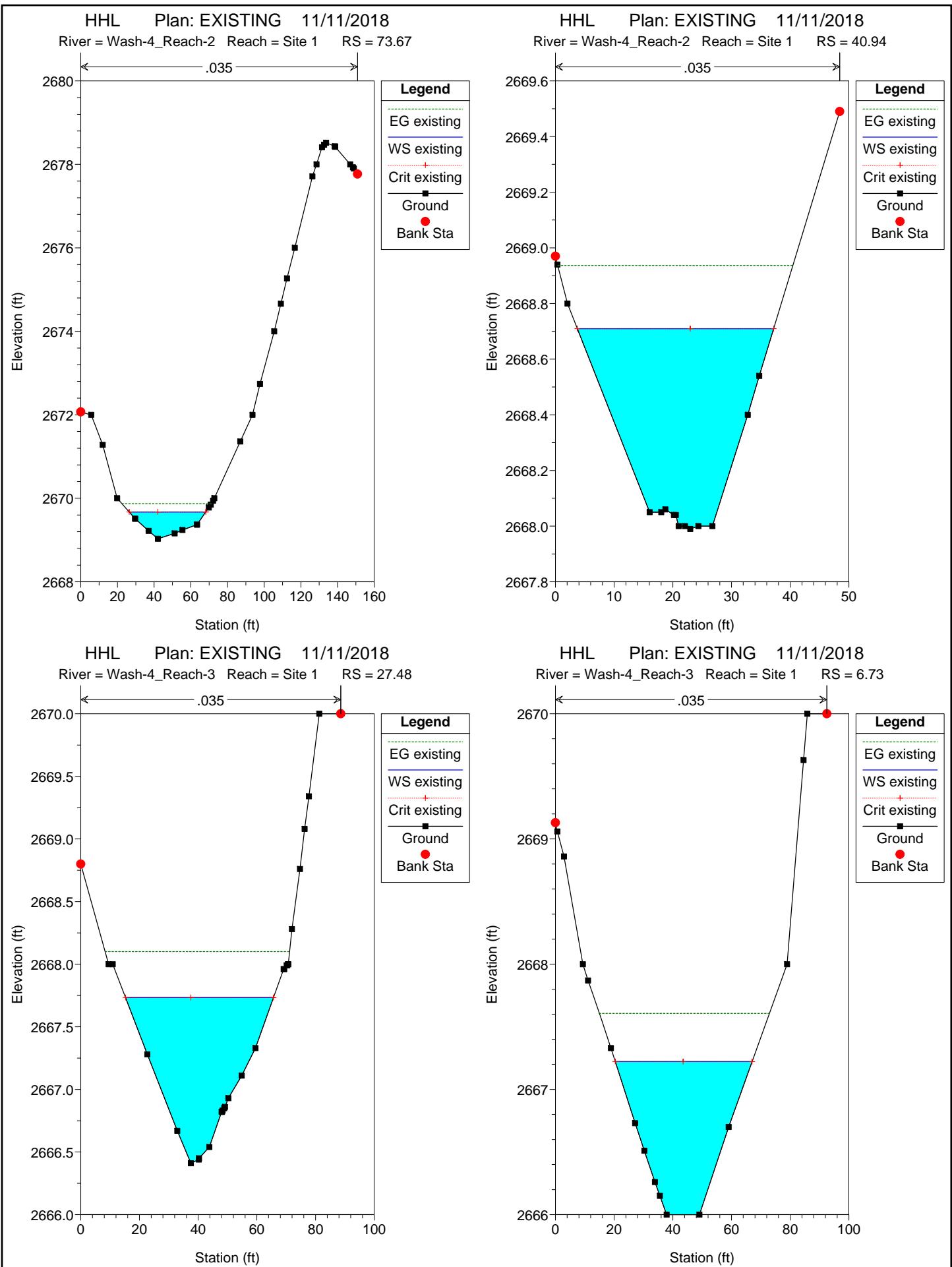




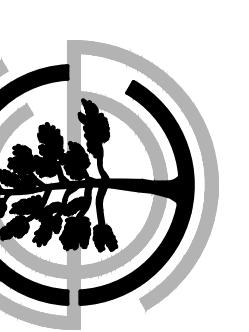






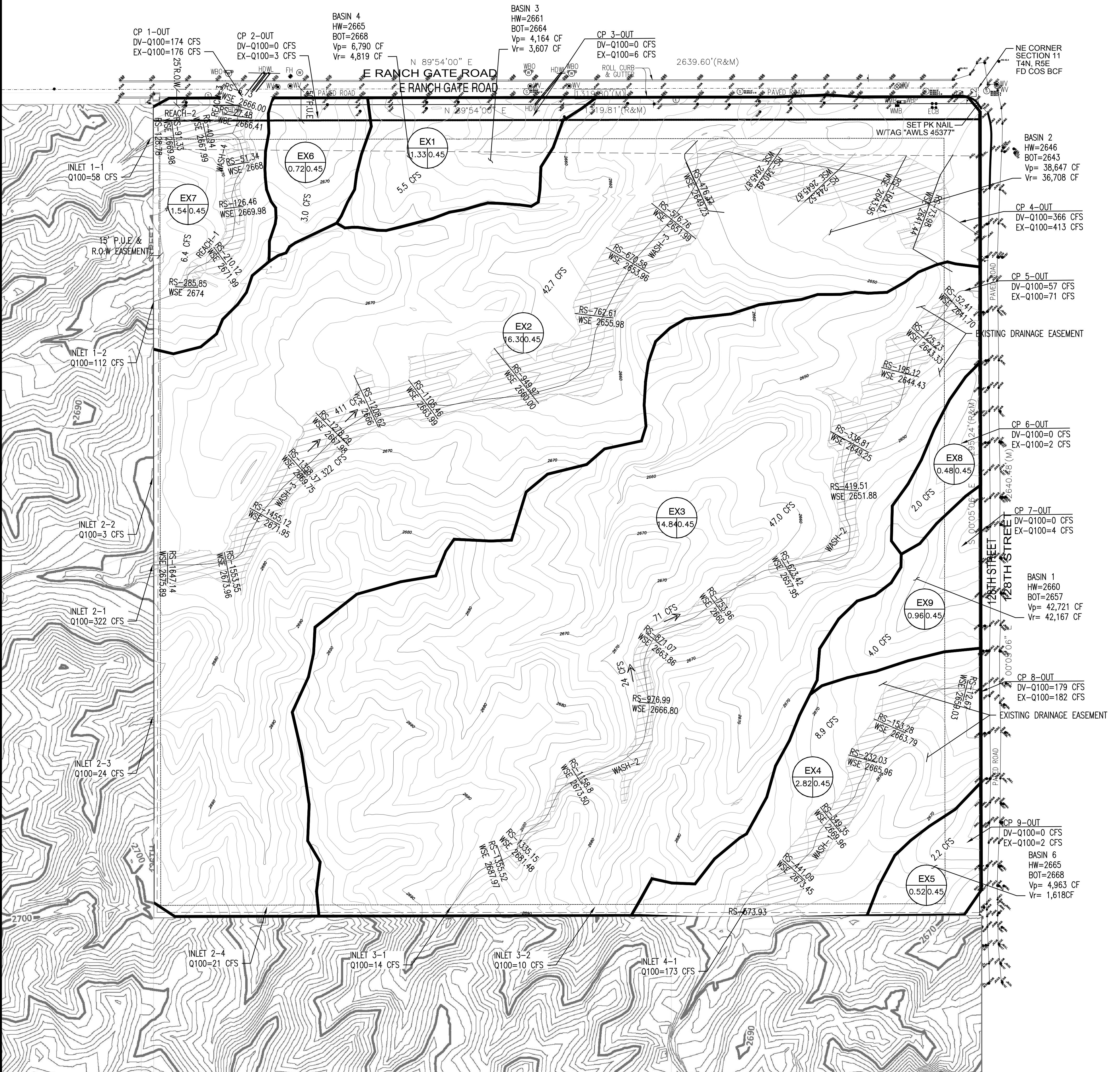


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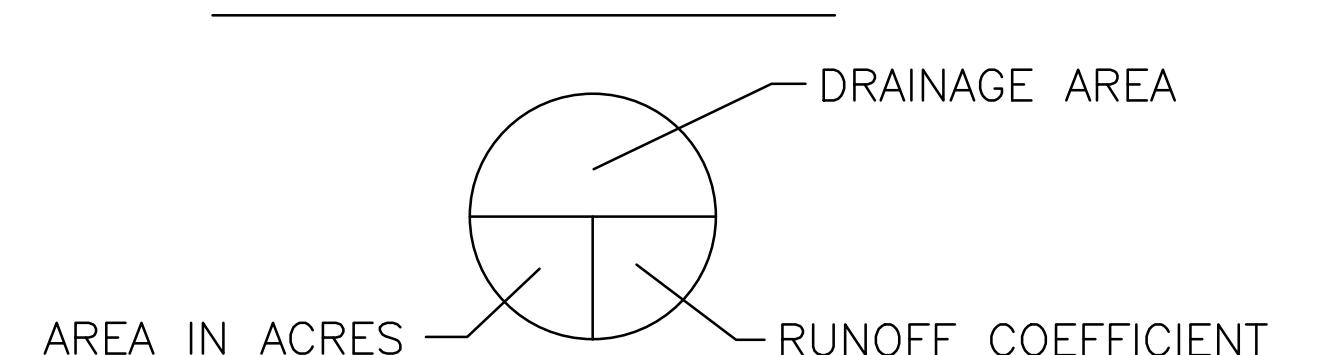
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0' 80' 160' 240'
SCALE: 1" = 80'



DRAINAGE AREA KEY

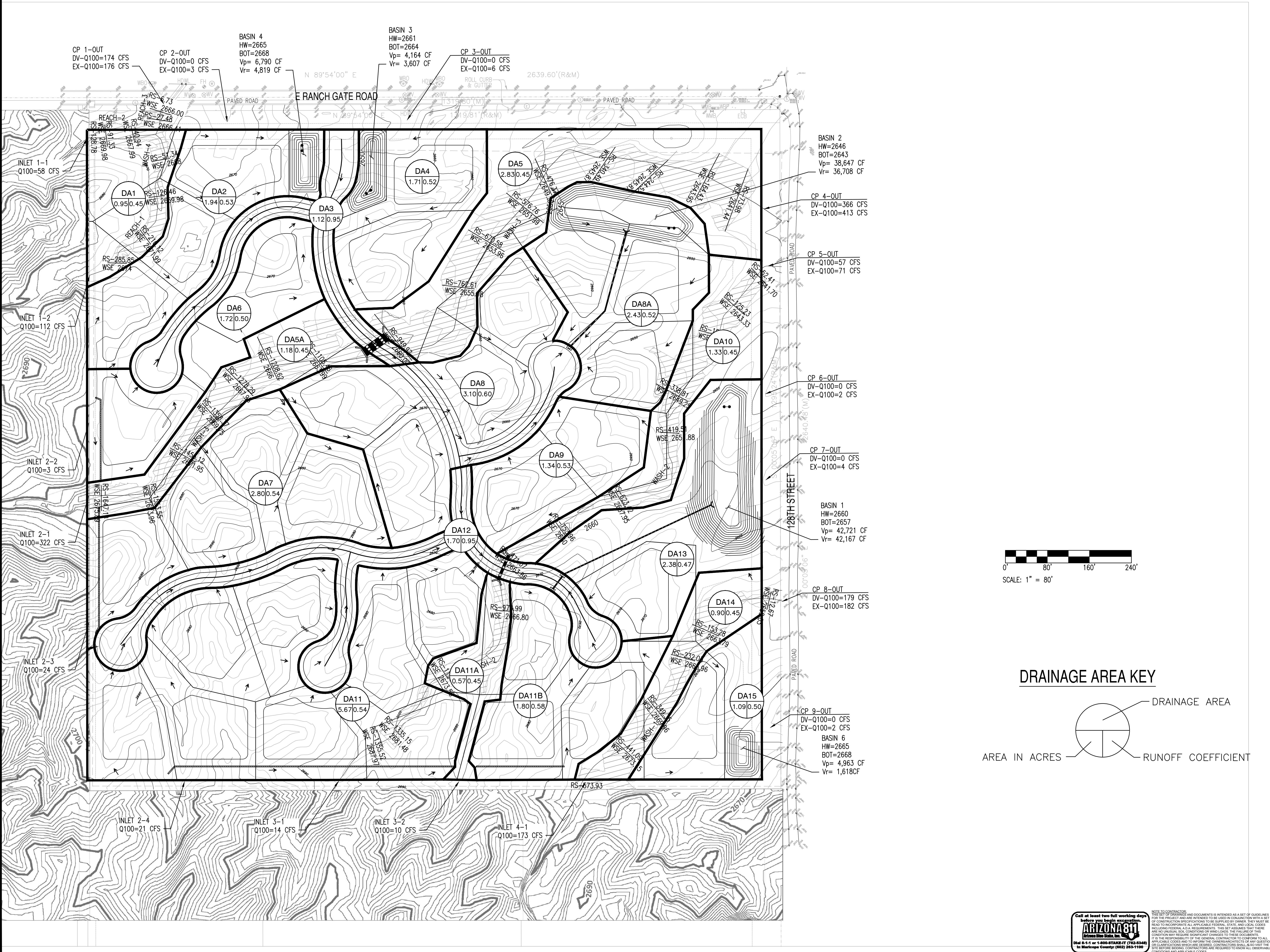


PROJECT	HHL PROPERTY
DRAWN	<input type="checkbox"/>
DESIGNED	<input type="checkbox"/>
CHECKED	<input type="checkbox"/>
PROJ. MGR.	ALI GULINO
DATE:	11/30/2018
ISSUED FOR:	REZONING
REVISION NO.:	
JOB NO.:	180424
SHEET TITLE:	EXISTING DRAINAGE AREA MAP
SHEET NO.:	



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APPENDIX III

Grading and Drainage Plans

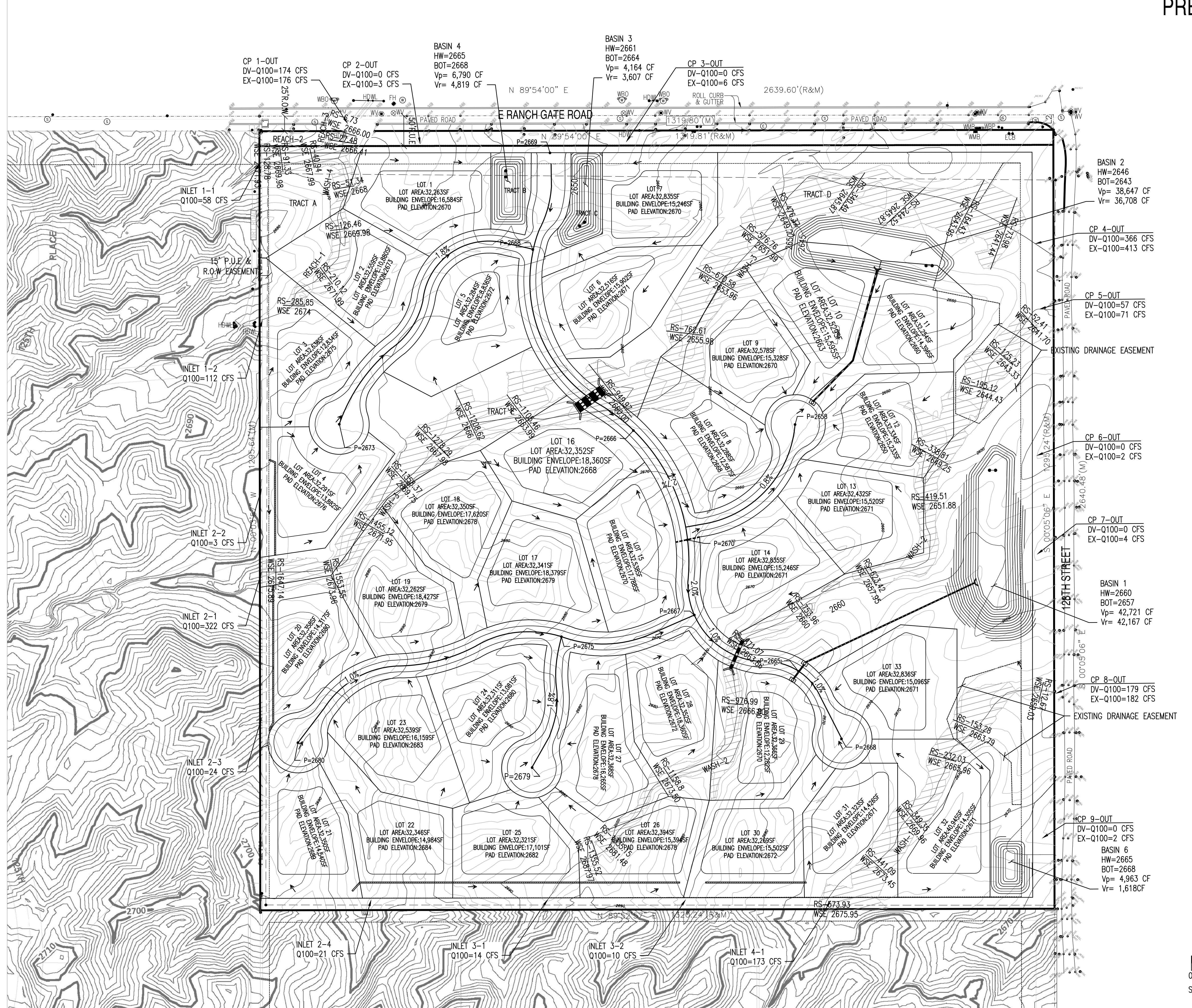
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Scottsdale, AZ 85260*

Sustainability Engineering Group

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APPENDIX

PRELIMINARY GRADING AND DRAINAGE PLAN



RETENTION VOLUME REQUIREMENTS:

REQUIRED VOLUME: 57,894 CF
PROVIDED VOLUME: 81,482 CF

LEGEND:

- EASEMENT LINE
- PROPERTY LINE
- EXISTING MAJOR CONTOUR
- LIMITS OF INUNDATION
- STORM DRAIN CB
- STORM DRAIN PIPE
- - - RIDGE LINE
- RETAINING WALL



PROJECT	HHL PROPERTY	LOCATION	128TH STREET AND RANCH GATE ROAD, SCOTTSDALE, AZ
DRAWN	ALI	DESIGNED	GULINO
CHECKED		PROJ. MGR.	
ISSUED FOR:	REZONING		
REVISION NO.:			
DATE:	11/30/2018		
DATE:			

JOB NO.: 180424
SHEET TITLE: PRELIMINARY GRADING AND DRAINAGE PLAN
SHEET NO.: 1
NOTE TO CONTRACTOR:
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